Ontario

AGRICULTURAL RESEARCH INSTITUTE OF ONTARIO
ANNUAL REPORT
APRIL 1, 1988 - MARCH 31, 1989

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Cover photo by Ken Barton
Communications Branch, OMAF

We recently revised the mailing list for the ARIO Report.
Please check your mailing label and advise us of additions or changes, particularly of postal or zip code. Thank you.

REPORT OF THE AGRICULTURAL RESEARCH INSTITUTE OF ONTARIO

Bowmanville, Ontario
April 1, 1989

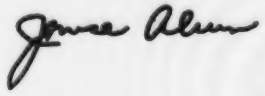
The Honourable David Ramsay
Minister of Agriculture and Food
Legislative Buildings
Toronto, Ontario
M7A 1A3

Dear Sir:

I have the honour to submit the twenty-seventh research *Report of the Agricultural Research Institute of Ontario* for the period April 1, 1988 to March 31, 1989.

The Institute wishes to express its sincere appreciation for the wholehearted cooperation of the administration and staff of the institutions at Alfred, Centralia, Guelph, Kemptville, New Liskeard, Ridgetown, Toronto, and Vineland in the planning and execution of research programs in agriculture, veterinary medicine, and consumer studies.

Respectfully submitted



J. Aluin
Chairman
Agricultural Research Institute of Ontario

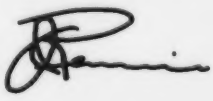
Toronto, Ontario
March 31, 1989

Dr. Janice Aluin, Chairman
Agricultural Research Institute of Ontario

Dear Madam:

I submit herewith a report of the Ontario Ministry of Agriculture and Food's research programs in agriculture, veterinary medicine, and consumer studies for the year ending March 31, 1989.

Respectfully submitted



J. C. Rennie
Director of Research
Agricultural Research Institute of Ontario

The Agricultural Research of Ontario Act passed by the Provincial legislature created the Institute in 1962 with the specific duties and responsibilities over the expenditure of the Ontario Ministry of Agriculture and Food's research funds for agriculture, veterinary medicine, and consumer studies. The ARIO meets every two months to review research programs, to inquire into whether or not they meet the needs of the industry, and to make recommendations to the Minister, where appropriate, on the expansion or reduction of programs and their human and physical resources.

The ARIO is composed largely of farmers and agribusiness people and its membership reflects the broadly based nature of Ontario's agricultural industry. The membership, of not more than fifteen, is appointed by the Lieutenant Governor in Council who also appoints the Director of Research from the Ministry.

Nine centres report to the ARIO: Agricultural Laboratory Services, Alfred College of Agriculture and Food Technology, Centralia College of Agricultural Technology, Economics and Policy Coordination Branch, Horticultural Research Institute of Ontario, Kemptville College of Agricultural Technology, New Liskeard College of Agricultural Technology, Ridgetown College of Agricultural Technology, and University of Guelph. The seven experimental stations, Alma, Arkell, Cambridge, Elora, Guelph, Ponsonby, and Woodstock, are managed by the University under contract with the Ministry.

Under the Act, the Institute may accept donations and grants of monies for research which are held in trust by the Director of Research and allocated for research in accordance with the terms of the funds. These funds are usually from commercial sources and are used for specific projects.

The ARIO is a unique corporate body responsible to the Minister of Agriculture and Food.

MEMBERS OF THE AGRICULTURAL RESEARCH INSTITUTE OF ONTARIO

Dr. J. Aluin, Chairman
Mr. W. Grieve, Vice-Chairman
Dr. J. C. Rennie, Director of Research
Ms M. Toivonen, Comptroller
Ms. C. Belluz
Mr. H. Brown
Ms. L. Cohoe
Ms. E. Hart
Mr. C. Hunter
Dr. S. Leuty
Mr. J. McDougall
Dr. Y. Martel
Mr. B. Schubert
Mr. T. Smyth
Mr. G. Strang
Dr. P. Wall
Ms. D. Whale

REPORTING INSTITUTIONS

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Building 43, McGilvray Street
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Guelph, Ontario
N1G 2W1

Alfred College of Agriculture & Food Technology **ACAFT**
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et alimentaire d'Alfred
P.O. Box 580
Alfred, Ontario
K0B 1A0

Centralia College of Agricultural Technology **CCAT**
Huron Park, Ontario
N0M 1Y0

Economics and Policy Coordination Branch **EPC**
Ontario Ministry of Agriculture and Food
801 Bay Street, 4th Floor
Toronto, Ontario
M7A 2B2

Horticultural Research Institute of Ontario **HRIO**
Vineland Station, Ontario
L0R 2E0

Kemptville College of Agricultural Technology **KCAT**
Kemptville, Ontario
K0G 1J0

New Liskeard College of Agricultural Technology **NLCAT**
New Liskeard, Ontario
P0J 1P0

Ridgetown College of Agricultural Technology **RCAT**
Ridgetown, Ontario
N0P 2C0

University of Guelph **UG**
Guelph, Ontario
N1G 2W1

BUDGET

1988-1989 RESEARCH FUNDING	Ontario Government Funding $	ARIO Trust Fund (year-end balance) $
Technology & Field Services	208,000.00	----------
Education & Research Division	5,073,000.00	----------
Agricultural Laboratory Services	410,000.00	----------
Economics & Policy Coordination Branch	680,000.00	----------
University of Guelph	23,400,000.00	----------
Horticultural Research Institute of Ontario	4,280,000.00	200,466.00
Alfred College of Agriculture & Food Technology	73,000.00	----------
Centralia College of Agricultural Technology	341,700.00	34,216.60
Kemptville College of Agricultural Technology	1,140,000.00	99,263.83
New Liskeard College of Agricultural Technology	943,000.00	54,660.02
Ridgetown College of Agricultural Technology	1,808,000.00	144,305.50
Ontario Crop Introduction & Expansion Program	500,000.00	----------
Special ARIO Trust Funds		
Red Meat Research Plan	----------	1,224,397.25
Ontario Pork Industry Improvement Plan	----------	2,266,665.24
Agriculture & Food Research Program	----------	1,769,068.90
Land Stewardship	----------	1,354,522.12
Food Systems 2002	----------	689,259.02
TOTAL	**38,148,908.00**	**5,369,692.40**

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Letter from the Chairman, ARIO

The Agricultural Research Institute of Ontario (ARIO) is a fifteen-member advisory body that reviews and recommends research programs funded by the Ontario Ministry of Agriculture and Food. At their six meetings each year, Institute members review current programs and consider proposals for new research directions, basing their decisions on what is most required by the industry, both short- and long-term.

In making decisions on programs and recommending future directions, the members are guided by two main principles: the research should fulfill the needs of the industry and be cost effective. Repetition of completed or current research is avoided and consideration is given to whether proposed research could be better done by another group or in conjunction with other institutions.

Since ARIO's membership includes both industry and research institution representatives, all of these factors can be sensibly considered.

During fiscal year 1988-89, the Institute considered a great quantity and variety of research material. Reviews of existing programs were central to most meetings, while a number of research proposals were also considered. The Institute received a number of special presentations and visited several research facilities across Ontario.

Members reviewed twelve research programs from the University of Guelph (UG) and the Ministry's (OMAF) institutions. Nine were approved as presented because they were considered to be relevant to the agrifood industry, financially viable, and well coordinated with similar research in federal and/or private institutions. Of the other three, two were approved at a subsequent meeting, after revisions, and the other will be presented again later this year.

The members review a program at least once every four years and either approve its continuation or ask for revisions in light of changed needs or circumstances.

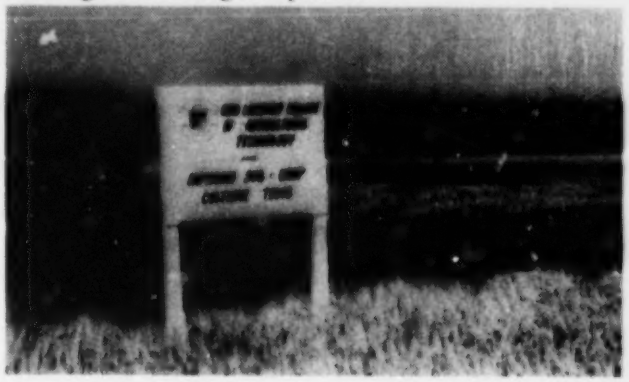
At each meeting, members receive progress reports on research funded by special ARIO research trust funds, such as the Ontario Land Stewardship Research Fund, the Food Systems 2002 Research Fund and the Ontario Pork Industry Improvement Plan Research Fund.

The Institute considered a number of special programs/proposals over the year. A proposal to support research on the Haldimand Clay Plain of south central Ontario was approved in principle. ARIO approved the concept of the Corn Research Institute, an idea strongly supported by the industry. A program in veterinary preventive medicine under the Department of Population Medicine at the Ontario Veterinary College was supported with the qualification that it be integrated with other veterinary programs.

Appropriate facilities are necessary for good research and a number of new ones, previously approved by ARIO, either were opened or are nearing completion. A dairy cattle barn at the Elora Research Station will allow more systematic work on the best preparation of heifers for lactation. An agronomy services building at Centralia College of Agricultural Technology has laboratories for field trial preparation and space for seed cleaning and quality assessment. A feed mill building at Ridgetown College is complete and will be operational this year. Experimental rations will be prepared there.

At Ponsonby Research Station, the dairy cattle unit for research on animal health was completed in August. There has been significant progress at the Alma Research Station for aquaculture, with completion of the hatchery, genetics and nutrition facility, power and isolation buildings, residence, equipment and storage facilities.

In northern Ontario, development of a number of new facilities is underway. Through New Liskeard College, soils and crops projects have begun in Nipissing and Parry Sound Districts, emphasizing the economics of treating lime deficient soils. At the northwest laboratories at Rainy River and Thunder Bay, the land has been tile drained and field service buildings are nearing completion.



The economics of lime-deficient soils will be studied at these new sites in Northern Ontario.

The Institute members discussed research recommendations of the Ontario Agricultural Services Coordinating Committees, using them as a base for setting ARIO priorities. The Institute considers the following areas to be of greatest concern: pest management, including biological controls and breeding for resistance to pests and diseases; optimal economic production; resource conservation, including soil, water, and more environmentally protective cropping systems; animal care, with emphasis on developing effective codes of practice; and the maintenance of high food quality, through improved testing and monitoring systems.

As a form of technology transfer, the series "Research in Transition" was approved. These four-page summaries of results of projects funded under the special research funds are available to anyone interested in the subject.

In the course of a year, ARIO members visit a number of research facilities, in conjunction with meetings. This past year, they visited Ponsonby, Elora and Alma Research Stations, Centralia College of Agricultural Technology, Ottawa/Carleton Plant Insect Relations group at the University of Ottawa, Allelix Inc. in Mississauga, and the large animal biotechnology facilities at the Ontario Veterinary College.

Special presentations were made at three meetings: Agriculture Canada scientists spoke on their work in cereals research, PSE pork, boar semen, and stress tolerance in tomatoes; a Nordion International representative made a presentation of the Canadian international situation in food irradiation; an OMAF representative spoke on wide-ranging provincial programs for conservation of soil and water resources.

In future, the Agricultural Research Institute of Ontario will continue to review research programs and assess requirements for research facilities. These activities are part of the challenging process of keeping agricultural research in Ontario in tune with the changing needs of the Industry.

J. Aluin
Chairman
ARIO

Letter from the Director of ARIO

Research programs funded by the Ontario Ministry of Agriculture and Food and reviewed by the ARIO cover a broad range of commodities and disciplines and include basic research projects and those geared to specific applied problems. Three fields receiving particular attention at present are a) biological controls for diseases and pests b) reduction of soil erosion and its attendant problem of water pollution and c) improving competitiveness of Ontario agricultural products.

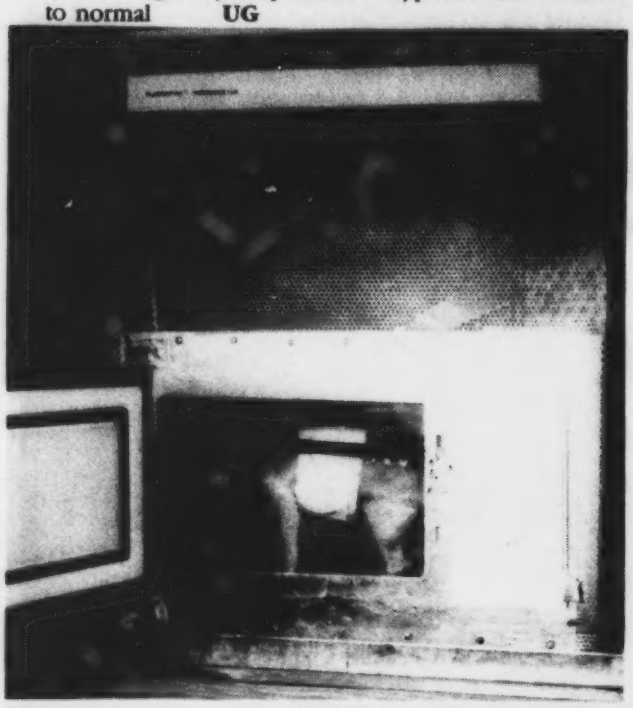
Overall, Ontario's research efforts are comprehensive, well coordinated and adaptable to changing needs and circumstances.

Given the wide range of projects and the number of institutions involved, significant accomplishments occur each year in most programs. To report on them all is impractical in this publication, but what follows is a brief account of some advances in Ontario agricultural research in 1988-89, a few of which already have appeared in the media.

Animal Production

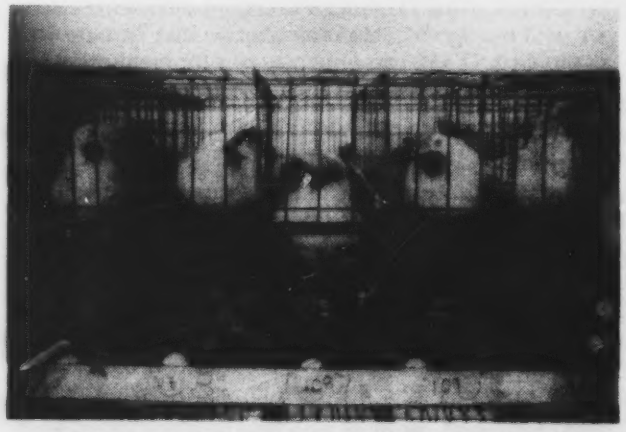
Livestock and poultry production is the largest segment of Ontario agriculture and its size is reflected in the amount of effort and budget devoted to animal research.

- a project on beef cow-calf operations found that first-calf heifers have stillbirth rates three times higher than mature dams; it is related to the fact that 25% of heifers needed help in calving, compared to 6% of mature cows **UG**
- producing twins by implanting an extra embryo 7 days after artificial insemination; resulted in returns from weaned calves, minus feed costs for cow and calves, of $417. for twin-bearing cows vs $155. for single-calf cows or 268% higher **UG**
- Holstein steers up to 1000 lbs raised on a high-energy diet of liquid protein supplement and by-pass protein, gained significantly better than did control animals; basic ration was 90% high moisture ear corn and 10% husks, a diet which can be mixed on farm **KCAT**
- B-group vitamins significantly lowered stress and improved weight gains significantly in calves purchased at 5-7 days old **KCAT**
- a milk test that detects infection with Bovine Leukemia Virus through the presence of antibodies has proven reliable on samples from more than 2000 cows; it eliminates the need for blood sample and is now used also to test for antibodies against Infectious Bovine Rhinotracheitis Virus **UG**
- a commercial milk progesterone test was found to be as sensitive as, and more specific than, rectal palpation in predicting the presence of a functional corpus luteum in cows not observed to be in heat; using it to help select cows for prostaglandin therapy may improve efficiency of reproductive health management **UG**
- in free-access, two-tiered pens, pigs performed satisfactorily and, because of the greater complexity, appeared less aggressive — an indication of the animals' improved well being **RCAT**
- microwaves are a safe and effective means of keeping newborn and weaner pigs warm; particularly effective in returning body temperature of hypothermic newborns to normal **UG**



Microwave beat helps restore a hypothermic piglet to normal body temperature. *Photo by D. M. Reid.*

- sows fed electronically in groups were compared to those in individual stalls, and group housing appears to be practical; no differences were observed in litter size, mortality rate, piglet weight at 21 days or the rate at which sows were culled **UG**
- a method to freeze and split embryos to produce identical twin sheep proved successful and will be used in preparing a shipment of embryos to Malaysia **UG**
- a new artificial insemination (AI) technique has improved conception rate of ewes to comparable with natural breeding, an advance which could form the basis for a viable sheep AI program in Ontario **UG**
- summer heat stress in laying hens has been partially alleviated by allowing the birds to perch on a water-cooled roost constructed of PVC piping **UG**



Helping hens keep cool with water-cooled PVC roosts.

- at the other end of the temperature spectrum, microwaves were found to be a satisfactory heat source for young chicks (as for piglets) which grow and reproduce normally; the same method can be used to incubate eggs **UG**

Microwaves are effective for incubating eggs. Photo by D. M. Reid.

- evaluation of New Zealand queen bees found that the stock is not well suited to Ontario conditions; queens frequently were superceded, many were poorly mated and/or improperly reared and their colonies had high winter mortalities **UG**
- analysis of stored honey from overwintering bees fed sugar syrup medicated with Teramycin (TM25) as an antibiotic against American and European foulbrood, showed no sign of TM25 one month after feeding was completed; OMAF recommendations for medicating fall sugar syrup will be revised in light of these data **UG**

Field Crops

Field crops are another major component of Ontario agriculture and research, including crops for both animal feed and human food.

- development of improved varieties: during the past year, the following oil and protein seed crop varieties were registered: white beans — OAC Sprint, OAC Sygnus, OAC Gryphon; soybean — OAC Eclipse; peanuts — OAC Ruby, OAC Tango; canola — OAC Winfield **UG**
- also released to seed growers in 1988: RCAT Alliance, a 3000 heat unit, soybean variety which has performed exceptionally well for all growers **RCAT**
- University of Guelph cereal program achieved the first North American success in regenerating plantlets from isolated microspore culture of barley **UG**
- patent pending for process for creating 'artificial' alfalfa seeds **UG**
- results from evaluating a number of pasture management procedures indicate that returns from properly-managed pastures are at least as high as from other cropping practices and average about $70/ha net **UG**

Horticultural Crops

Horticulture is a broadly-based industry, covering fruit, vegetable, ornamental and floral crops and turfgrass.

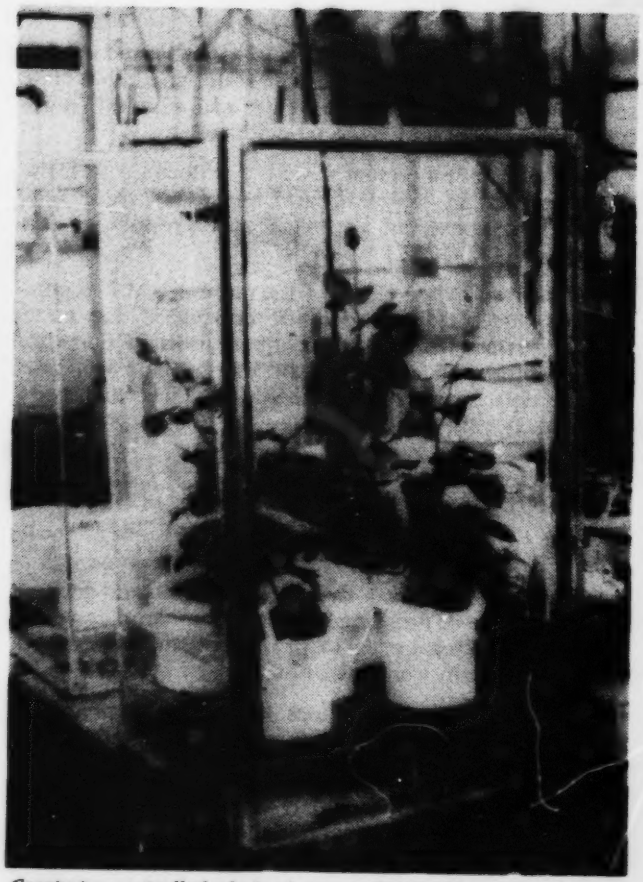
- production guidelines are now available for growers of day-neutral strawberries and will extend Ontario's strawberry season from early June to mid-October; produced in association with Cornell University and the first published in North America **HRIO**
- mid-season fresh-market strawberry variety, Settler, was released in 1988 **UG**

Strawberry variety, Settler, released by UG.

- marketable yield soft melons were 44% higher when they were grown using black plastic mulch and 69% higher when mulch and plastic tunnels were used; mulch conserved soil moisture, increased soil temperature, improved fruit quality, suppressed weeds **HRIO**
- foliar calcium was found to delay maturity and increase firmness in McIntosh apples, but did not affect preharvest drop **HRIO**
- gross annual returns for high-density pear plantings were found to be as high as $10,000/ha with yields of 35 t/ha **HRIO**
- growing tomato seedlings in plug trays has helped the industry increase, in the past three years by 500%, to 50 million tomato transplants in 1988 **RCAT**
- two new potato varieties registered; Eramosa, Canada's earliest maturing variety; Saginaw Gold, a new standard for chipping **UG**

Dr. Robert Coffin with 'Eramosa', the earliest maturing potato variety in Canada.

- the marketable yield of G40 × G203, the most productive of 141 asparagus lines from crosses planted at the Cambridge Research Station, was 3372 kg/ha, more than twice that of Jersey Centennial and four times that of Viking 2G; Lucullus Mid-Season is no longer recommended because of low yields **UG**
- an advanced breeding population of rutabaga has been synthesized which shows very high resistance to turnip mosaic virus (TuMv) and has good horticultural characteristics **UG**
- garlic, jumbo onions and oriental vegetables have been identified as showing the best possibilities for expanded production: Early removal of the flowering stalk of garlic increases bulb yields by an average of 30%; 'Music', a local garlic strain, has been identified as a superior cultivar. **HRIO**
- as a soilless growing medium, lower-priced domestic rockwool produced yields equal to those from imported media; optimum nutrition levels and planting stages for tomatoes grown in rockwool were established and passed on to growers **HRIO**
- the need for less expensive ingredients in container culture mixes for nurseries has led to recommendations on the use of spent mushroom compost for this purpose **HRIO**
- supplementary lighting for greenhouse roses over two years increased yields consistently in five commercial cultivars by 72-86% at 100 umol/sec/m2 (800 fc) irradiation 24 hr/day from October to March; commercial grades were unaffected, but more roses were harvested within each grade, giving higher returns per unit of greenhouse **UG**



Computer-controlled whole-plant net photosynthesis chamber for fine-tuning growing conditions for roses.

- significant progress has been made in determining the potential effectiveness of biological control agents, isolates of Typhula phaccorrhiza, to control grey snow mold on turfgrass, which would reduce the need for fungicides; fungus Fusarium heterosporum also shows potential as biological control for dollarspot disease of creeping bentgrass **UG**

Food Crops Preservation

Preservation of our food crops is of prime importance, not only to increase our self-sufficiency, but to make it possible for our industry to compete with imported produce. Therefore, a good deal of effort is put into research on the food half of "agriculture and food".

- apple harvest strategies have been aided by the development of starch-iodine test colour charts for monitoring maturity in the main Ontario apple varieties and a factsheet on this test have been published for Empire, Idared and Spartan **HRIO**
- technical and research support has allowed a second processor of juice from Ontario grapes to enter the market, with a line of kosher grape juice products **HRIO**
- studies on low-oxygen storage of McIntosh apples show that fruit remains firmer if first stored at 1% for four months, then at 3% for four months; it had little effect on Northern Spy but, at 0.5 and 3.0, kept Empire, Spartan, Delicious, Golden Delicious and Idared apples firm and helped control physiological disorders such as scald and brown core **UG**

Economics and Farm Management

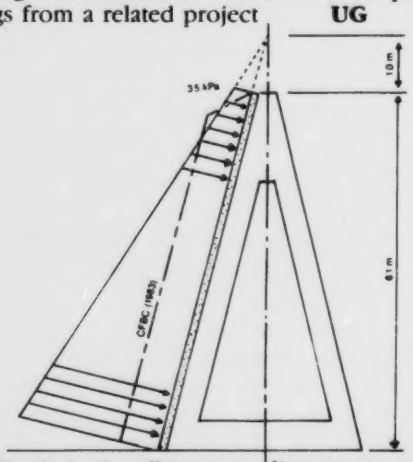
Business practices must be financially feasible and in tune with world market conditions. Economics research is concerned with the international picture and with individual farm management and financial practices.

- a survey determined that there is a wide range of techniques used in analyzing farm businesses; more uniform and consistent approach and terminology are needed **CCAT**
- examination of the effect of the current GATT negotiations on Canadian agriculture concluded that trade liberalization will require reorganization of Canada's agricultural policies; likely, the dairy sector will lose protection, but red meats and eastern grain and oilseeds will likely gain **UG**

Engineering

Engineering research ranges from work on improved livestock housing to studies to help update current standards and codes.

- two years of data show that the rate of gain and general performance of finishing hogs raised in naturally ventilated buildings are equal to, or higher than, those raised in mechanically ventilated housing **ACAFT**
- researchers found pigs kept themselves appreciably cleaner when their pens are fitted with solid, rather than spindle partitions **UG**
- tests on eight commercial hay-drying fans revealed significant variations in pressures and rate of flow, making it difficult for a farmer to choose the appropriate one; researchers recommend that companies supply a graph showing their product's specifications **KCAT**
- success of mole drains installed in clay soils led to publication of a complete set of guidelines on this type of drainage **ACAFT**
- lateral pressures near the unloading equipment in bottom-unloading silos are much greater than in top-unloading silos, but are not in the Canadian Farm Building Code (CFBC). Researchers established specific values for the friction coefficient and pressure ratio, which will be part of altered standards in the 1990 CFBC. The 1990 code also will contain drastically different provisions for the design of bunker silo walls, based on preliminary findings from a related project **UG**



Analytically derived wall pressure diagram on a 6.1-m-high bunker silo wall; CFBC (1983) pressure shown for comparison.

Pest Management

Control of pests and diseases is essential for a viable agricultural industry. As a means of reducing the amount of man-made chemical pesticides in the environment, considerable effort is being put into the development and testing of biological pest controls. Means are being developed whereby crops can be monitored for pest infestations, to target pesticide applications most efficiently.

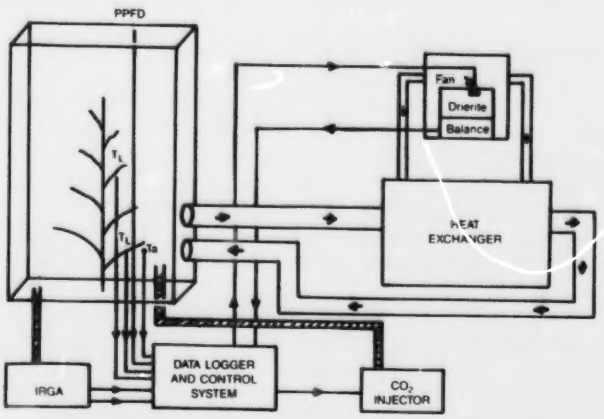
Beans infected with white mould: sprayed on left, unsprayed on right.

- as biological control for St. John's-wort, researchers placed hundreds of Chrysolina beetles on Manitoulin Island; they've already reduced the need for herbicides **UG**
- Holcothorax testaceipes, a parasite of spotted tentiform leafminer, has become established in Guelph and could be a viable alternative control to chemicals in the orchard **UG**
- pre-treating plants with triazole compounds increases their resistance to heat, cold and drought and, air pollutants, ozone and sulphur dioxide; decomposition of the oxidative membrane is inhibited, possibly from observed increases in cell concentrations of the antioxidants tocopherol and ascorbate **UG**

Soil and Water Management

Soil and water management is the heart of agricultural production. Increasing concern about erosion and pollution has led to greater emphasis on research in prevention and mitigation of destructive practices.

- studies have shown that the Ontario land areas draining into the Upper Great Lakes connecting channels is contributing to impaired water quality in the channels region; clearly rural landowners need to undertake comprehensive soil and water management; also required are improved and integrated water quality monitoring systems and better defined water quality standards for agricultural pesticides **UG**
- discovery that soil water content directly affects crop photosynthesis has important implications for modelling and forecasting crop yields **UG**



Schematic diagram of enclosure system for field assessment of the effect of soil water content on crop photosynthesis (redrawn from Graham et al. 1888b). Single lines with arrows represent wires carrying control signals from or sensor signals to the computerized control system. Parallel lines with arrows between them are air ducts attached to the heat exchange system, and those with hatch marks are sampling and injection tubing. Sensors provide continuous monitoring of leaf temperature (T_L), air temperature (Ta), and quantum flux (PPFD), and an infrared gas analyzer (IRGA) monitors CO_2 and H_2O concentrations.

- field crop yields under minimum or zero tillage were found to be similar to those under conventional tillage; N requirements are similar for all types of tillage **UG**

- analysis of various predictive models for soil and conservation programs revealed that outputs from different ones can be surprisingly, even alarmingly, variable for some conditions; guidelines are needed to make better and more appropriate use of such models **UG**

Agroforestry is a relatively new approach to, among other things, reducing erosion and runoff pollution and improving damaged land.

- studies show that the survival rate for hybrid poplar cuttings planted along Washington Creek was from 10-76% and from 28-80% for rooted stock; alder clones survived very well, with little difference in growth in diameter among the clones tested. **UG**

I am pleased to present this outline of research results arising from programs funded by the Ministry of Agriculture and Food and reviewed by the Agricultural Research Institute of Ontario.

J. C. Rennie
Director of Research
ARIO

Lettre du président de l'IRAO

L'Institut de recherche agricole de l'Ontario est un corps consultatif composé de quinze membres dont l'objectif est de revoir et de recommander des programmes de recherche financés par le ministère de l'Agriculture et de l'Alimentation de l'Ontario. Lors de leurs six réunions annuelles, les membres de l'Institut passent en revue les programmes en cours et étudient les possibilités de nouvelles orientations pour la recherche, leur choix étant établi selon les besoins les plus pressants de l'industrie qu'ils soient à long ou à court terme.

Deux grands principes guident ces membres dans leurs choix de programmes et leurs recommandations quant aux nouvelles orientations : la recherche doit répondre aux besoins de l'industrie et occasionner le moins de dépenses possible. On évite ainsi de répéter une recherche en cours ou déjà complétée et on peut également voir si un projet de recherche serait mieux réalisé par un autre groupe ou avec la participation d'autres organismes. Tous ces facteurs sont pris en considération puisque les membres de l'IRAO sont recrutés parmi les représentants de l'industrie et ceux des instituts de recherche.

Au cours de l'exercice financier 1988-89, l'Institut s'est penché sur de nombreux projets de recherche portant sur une variété de sujets. La plupart des réunions ont porté sur la révision des programmes déjà existants, bien que de nouveaux projets aient également été considérés. L'Institut a reçu de nombreuses présentations et a été invité à visiter plusieurs établissements de recherche dans tout l'Ontario.

Les membres ont passé en revue douze programmes de recherche de l'Université de Guelph (UG) et des organismes du ministère (MAAO). Neuf d'entre eux ont été acceptés tels que présentés puisqu'on les a jugés étroitement liés à l'industrie agro-alimentaire, financièrement viables, et bien coordonnés à d'autres programmes de recherche semblables provenant d'organismes privés ou fédéraux. Lors d'une réunion suivante, les membres de l'Institut ont approuvé deux des trois derniers programmes après qu'ils ont été révisés et le dernier sera présenté à nouveau plus tard cette année.

Les membres revoient chaque programme au moins une fois aux quatre ans et ils en recommandent le maintien ou demandent qu'il soit révisé en fonction du changement des besoins ou des circonstances.

À chaque réunion, les membres reçoivent un compte-rendu sur la recherche effectuée grâce à un fonds en fiducie spécial de l'IRAO pour la recherche, tels le Fonds de recherche pour la gestion des terres de l'Ontario (Ontario Land Stewardship Research Fund), le Fonds de recherche pour la production alimentaire 2002 (Food System 2002 Research Fund) et le Fonds de recherche pour le programme d'amélioration de l'industrie du porc.

L'Institut a étudié de nombreux programmes ou projets spéciaux durant l'année. On a accepté en principe la proposition qui consistait à appuyer la recherche sur les plaines Haldimand Clay du centre-sud de l'Ontario. L'IRAO a approuvé le concept de l'Institut de recherche pour le maïs (Corn Research Institute), une notion que l'industrie appuie fortement. Un programme de médecine vétérinaire préventive qui relève du Department of Population Medecine au Collège de médecine vétérinaire de l'Ontario (Ontario Veterinary College) a été endossé à condition qu'il soit intégré à d'autres programmes de médecine vétérinaire.

Comme des installations adéquates sont nécessaires pour que la recherche soit efficace, de nombreux endroits déjà approuvés par l'IRAO ont vu le jour ou seront complétés sous peu. Une étable pour vaches laitières construite à la station de recherche d'Elora permettra un travail plus systématique pour une meilleure préparation des génisses à la lactation. Un bâtiment destiné aux services agronomiques et situé au Collège de technologie agricole de Centralia possède des laboratoires pour la préparation d'essais dans le champ et des endroits réservés au nettoyage des semences et à l'évaluation de leur qualité. Le Collège de Ridgetown abrite une meunerie qui sera fonctionnelle cette année. On y préparera des rations expérimentales.

À la station de recherche Ponsonby, une installation pour vaches laitières permettant la recherche sur la santé des animaux a été complétée en août dernier. Il y eut aussi un progrès remarquable en aquaculture à la station d'Alma où on a construit l'incubateur, l'installation pour la recherche en génétique et en nutrition, la centrale électrique et les bâtiments d'isolement, la résidence, les remises et les entrepôts.

L'érection de nombreuses installations est aussi en cours dans le nord de l'Ontario. Par l'entremise du collège New Liskeard, on a mis sur pied des projets de recherche sur les cultures et le sol dans les districts du Nipissing et de Parry Sound, en soulignant fortement les avantages économiques que présente l'amendement des sols déficients en chaux. Dans les laboratoires du nord-ouest, à Rainy River et à Thunder Bay, le terrain est maintenant drainé par tuyaux et le complexe s'y rattachant est presque terminé.

On se penchera sur le côté économique des sols déficients en chaux à ces nouveaux sites dans le nord de l'Ontario.

Les membres de l'Institut ont discuté des recommandations sur la recherche faite par les Comités de coordination des services agricoles en Ontario (Ontario Agricultural Services Coordinating Committees), se servant d'elles pour établir leurs priorités. L'Institut accorde une importance particulière aux domaines suivants : la lutte contre les ennemis des cultures, tant par la lutte biologique que par les croisements d'espèces résistants aux parasites et aux maladies; la production économique optimale; la préservation des ressources comme le sol et l'eau; la mise au point de pratiques culturales plus propices à la protection de l'environnement; le soin des animaux, spécialement l'élaboration de pratiques plus humaines; et le maintien de la haute qualité du produit par des tests et des systèmes de contrôle améliorés.

On a approuvé la série "Research in Transition" pour en faire une sorte de transfert technologique. Ces résumés de quatre pages qui citent les résultats de projets approvi-

sionnés par les fonds de recherche spéciaux sont mis à la disposition de tous ceux qui sont intéressés au sujet.

Au cours d'une année, les membres de l'IRAO visitent de nombreuses installations de recherche, ces visites prenant souvent la forme de réunions. L'année dernière, ils ont visité les stations de recherche Ponsonby, Elora et Alma, le Collège de technologie agricole de Centralia, le groupe Relations plantes/insectes de la région Ottawa/Carleton (Ottawa/Carleton Plant Insect Relations group) de l'Université d'Ottawa, Allelix Inc. à Mississauga, et le très grand établissement de biotechnologie animale du Collège de médicine vétérinaire de l'Ontario.

Des présentations spéciales ont été faites lors de trois réunions : des scientifiques d'Agriculture Canada ont présenté leurs travaux de recherche sur les céréales, le porc PSE, les semences de verrats, et la tolérance des tomates au stress; un représentant de Nordion International a fait une présentation sur la situation internationale du Canada en matière d'irradiation des aliments; un représentant du MAAO a fait état de la gamme variéé des programmes provinciaux pour la préservation des richesses que sont le sol et l'eau.

L'Institut de recherche agricole de l'Ontario continuera au cours des années à venir à réviser les programmes de recherche et à évaluer les besoins pour des établissements de recherche. Ces activités sont un élément du défi que constitue le maintien de la recherche agricole au diapason des besoins changeants de l'industrie.

J. Aluin
Le Président de l'IRAO

Lettre du directeur de l'IRAO

Les programmes de recherche subventionnés par le MAAO et révisés par l'IRAO couvrent une vaste étendue de produits et de disciplines, incluant des projets de recherche élémentaire ainsi que d'autres touchant à des problèmes spécifiques. Présentement, l'attention se porte sur trois domaines en particulier: a) la lutte biologique contre les maladies et les parasites b) la réduction de l'érosion du sol et le problème de la pollution de l'eau qui s'y rattache et c) l'amélioration de la concurrence sur le plan des produits agricoles de l'Ontario.

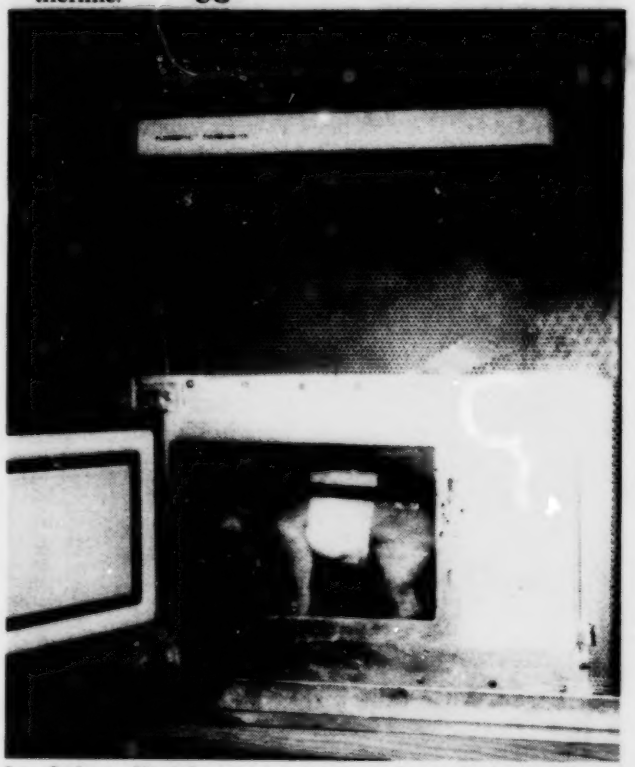
Dans l'ensemble, les efforts de recherche déployés en Ontario sont vastes, bien coordonnés et bien adaptés aux conditions et aux besoins changeants.

Étant donné la variété de projets et le nombre d'institutions qui sont impliquées, de grands pas sont accomplis chaque année dans la plupart des projets. Il est impossible de mentionner dans cette publication le progrès accompli dans tous les programmes, mais ce qui suit est un bref aperçu de l'avancement fait dans la recherche agricole de l'Ontario en 1988-89, certaines de ces réalisations ont déjà été révélées par les médias.

Production animale

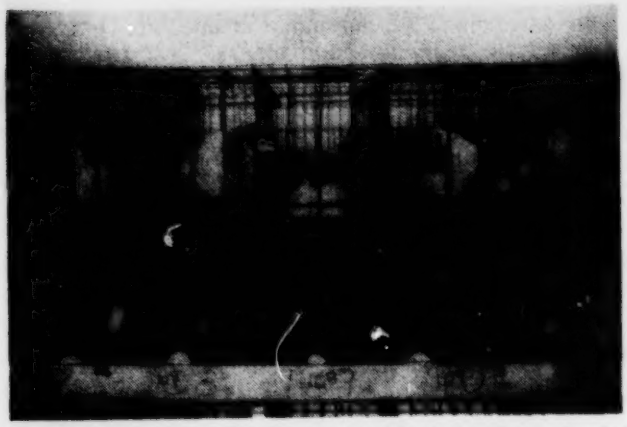
La production du bétail et de la volaille est le plus grand segment de l'agriculture en Ontario et son importance est reflétée dans la somme des efforts consentis et du budget accordé à la recherche animale.

- un projet sur les entreprises bovines de naissage indique que les génisses ont un taux de mortalité à la naissance trois fois plus élevé que les vaches adultes; ceci est dû au fait que 25% des génisses ont besoin d'aide pour vêlage comparé à 6% pour les vaches adultes. **UG**
- la production de jumeaux en implantant un autre embryon sept jours après l'insémination artificielle a entraîné un gain de 417 $ au sevrage, une fois déduit le coût d'alimentation de la vache et des veaux, comparativement à 155 $ pour les vaches qui n'ont porté qu'un veau, soit une augmentation de 268%. **UG**
- les taurillons Holstein de 1 000 livres ou plus élevés à partir d'une diète riche en énergie et composée d'un supplément liquide de protéine et de protéine tannée, ont engraissé beaucoup mieux que les animaux témoins. Quatre-vingt-dix pourcent (90%) de la ration de base était composé de maïs-épi humide et l'autre 10%, des épluchures de l'épi, un aliment qu'on peut facilement préparer à la ferme. **KCAT**
- les vitamines du groupe B ont produit une baisse considérable du stress et amélioré sensiblement les gains de poids des veaux achetés à l'âge de 5-7 jours. **KCAT**
- un test fait sur le lait pour détecter les infections causées par le virus de la leucémie bovine par le repérage d'anticorps s'est montré fiable lorsqu'il a été mis à l'essai sur des échantillons provenant de plus de 2 000 vaches. Il élimine le besoin des échantillons sanguins et est maintenant utilisé pour découvrir les anticorps du IBR, virus infectueux de la Rhinotrachéite bovine. **UG**
- un test commercial de progestérone effectué sur le lait s'est avéré aussi sensible et plus précis que la palpation rectale pour déceler la présence d'un corps jaune fonctionnel chez la vache qui ne semble pas en chaleur. Ce test pourrait faciliter le choix des vaches nécessitant un traitement de prostaglandine et améliorer l'efficacité de la régie en reproduction animale. **UG**
- le rendement des porcs placés dans des cages à gradins à libre accès s'est révélé satisfaisant et à cause d'une plus grande liberté de mouvement, ils paraissaient moins agressifs — une indication de l'amélioration du bien-être des animaux. **RCAT**
- les micro-ondes sont un moyen sécuritaire et efficace de garder les porcelets sevrés et les nouveau-nés au chaud; elles s'avèrent particulièrement efficaces quand il s'agit de rétablir la température des porcelets atteints d'hypothermie. **UG**



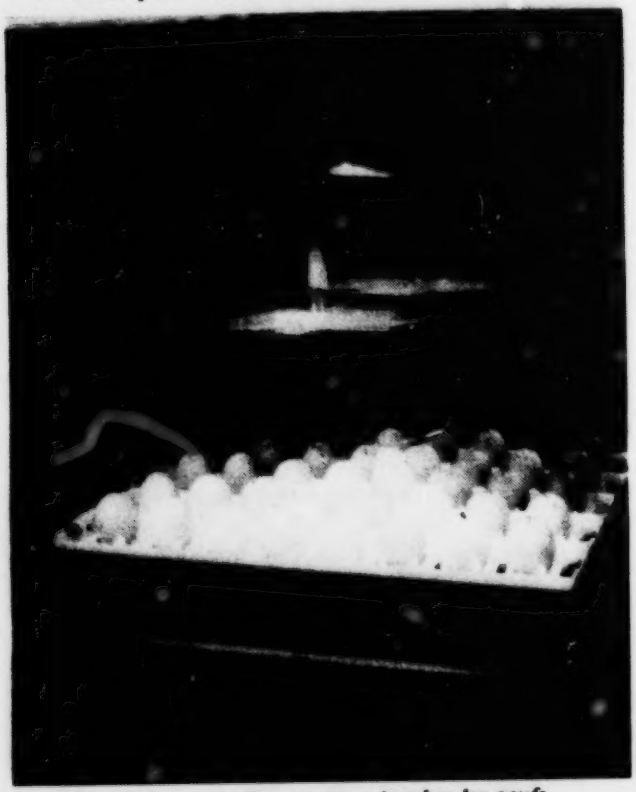
La chaleur dégagée par les micro-ondes aide à rétablir la température normale d'un porcelet atteint d'hypothermie.
Photo de D.M. Reid.

- les truies regroupées pour être nourries par moyens mécaniques ont été comparées à celles qui étaient en loges individuelles; le logement communautaire semble être pratique puisqu'on n'a observé aucune différence dans le nombre de la portée, le taux de mortalité, le poids des porcelets de 21 jours ou le taux de réforme des truies. **UG**
- une méthode de congélation et de séparation des embryons pour la production d'agneaux identiques a été réussie. On l'utilisera pour préparer une expédition d'embryons en Malaisie. **UG**
- une nouvelle technique d'insémination artificielle (IA) a amélioré le taux de conception des brebis à un niveau comparable à celui de l'accouplement naturel, un avancement qui peut former la base d'un programme d'IA viable pour l'élevage du mouton en Ontario. **UG**
- le stress causé par la chaleur de l'été chez les poules pondeuses a été presque annulé lorsque ces dernières ont pu se poser sur un perchoir fabriqué en tuyaux PVC refroidis à l'eau. **UG**



Le raffraîchissement des poules à l'aide de perchoirs de PVC refroidis à l'eau.

- à l'autre bout du spectrum des températures, on a découvert que les micro-ondes constituent une source de chaleur satisfaisante pour les jeunes poussins (comme pour les porcelets) en les amenant à croître et à se reproduire normalement; on peut utiliser la même méthode pour incuber les oeufs. **UG**



Les micro-ondes sont efficaces pour incuber les oeufs. Pboto de D.M. Reid.

- une étude sur les abeilles reines provenant de la Nouvelle-Zélande a démontré que le stock n'est pas bien assorti aux conditions de l'Ontario; les reines sont souvent supplantées, plusieurs d'entre elles étaient mal accouplées ou mal élevées, et leurs colonies subissaient une mortalité hivernale marquée. **UG**
- l'analyse du miel entreposé provenant d'abeilles hibernantes à qui on a donné du sirop médicamenté de terramycine (TM25) contre la loque américaine et la loque européenne, n'a révélé aucune trace de TM25 un mois après son administration; les recommandations du MAAO quant au sirop médicamenté d'automne seront révisées à la lumière de ces nouvelles données. **UG**

Grandes cultures

Les grandes cultures, qu'elles soient pour la consommation humaine ou animale, sont une autre composante majeure de l'agriculture et de la recherche en Ontario.

- on a créé au cours de l'année dernière des variétés améliorées de semences de récoltes protéiniques ou oléagineuses. Ont été homologuées : fève blanche — OAC Sprint, OAC Sygnus, OAC Gryphon; soya — OAC Eclipse; arachides — OAC Ruby, OAC Tango; canola — OAC Winfield. **UG**
- on a mis aussi à la disposition des producteurs la RCAT Alliance, une variété de fève soya de 3 000 unités thermiques qui leur a tous donné un bon rendement. **RCAT**
- c'est dans le programme des cultures céréalières de l'Université de Guelph qu'on a réussi pour la première fois en Amérique du Nord à régénérer des plantules à partir d'une culture de microspores d'orge. **UG**
- on a déposé un brevet pour la création de graines de luzerne "artificielles". **UG**
- les résultats d'une évaluation d'un certain nombre de pratiques en gestion de pâturage indiquent que les ravenus des pâturages bien gérés sont au moins aussi élevés que celles d'autres pratiques culturales et rapportent environ 70 $/ha net. **UG**

Cultures horticoles

L'horticulture est une industrie à grande échelle qui concerne les fruits, les légumes, les cultures ornementales et florales ainsi que les gazons.

- un guide de production est maintenant disponible pour les producteurs de fraises à jours neutres qui permettra d'en prolonger la saison du début de juin à la mi-octobre; ce guide est produit avec la collaboration de l'Université Cornell et est le premier du genre à être publié en Amérique du Nord. **HRIO**
- la variété de fraises Settler, destinée à la vente à l'état frais à la mi-saison, a fait son apparition en 1988. **UG**

La Settler, variété de fraises mise sur le marché par l'UG.

- la récolte de melons doux a augmenté de 44% en utilisant un paillis de plastique noir et de 69% en utilisant le paillis et des tunnels de plastique; le paillis conserve au sol son humidité, en augmente la température, améliore la qualité du fruit et supprime les mauvaises herbes. **HRIO**

- on a découvert qu'une application foliaire de calcium retarde la maturité et augmente la fermeté des pommes McIntosh, sans affecter la chute prématurée du fruit. **HRIO**

- le revenu brut d'une plantation dense de poiriers peut s'élever jusqu'à 10 000 $/ha et les récoltes à 35 t/ha. **HRIO**

- les plants de tomates semés dans des gobelets de tourbe ont fait croître l'industrie de 500% au cours des trois dernières années. En 1988, elle était établie à 50 millions de plants. **RCAT**

- on a homologué deux nouvelles variétés de pommes de terre : l'Eramosa, variété la plus précoce au Canada, et la Saginaw Gold, nouveau standard pour l'industrie des pommes de terre frites. **UG**

Le docteur Robert Coffin avec l'Eramosa, la variété de pomme de terre la plus précoce au Canada.

- la récolte commercialisable de la G40 X G203, lignée d'asperge la plus productive parmi les 141 issues de croisements plantés à la station de recherche Cambridge, a produit 3 372 kg/ha, plus du double de la production de la Jersey Centennial et quatre fois plus que la Viking 2G; on ne recommande plus la Lucullus Mid-Season à cause de sa faible récolte. **UG**

- on a synthétisé une culture améliorée de rutabaga démontrant une très grande résistance au virus de la mosaïque du navet (TuMv) et possédant de bonnes caractéristiques horticoles. **UG**

- l'ail, les oignons géants et les légumes orientaux sont les cultures possédant les meilleures possibilités d'expansion : l'enlèvement précoce du pédoncule en fleurs de l'ail augmente la récolte de bulbes d'environ 30%; le 'Music', une lignée d'ail locale s'avère être le meilleur cultivar. **HRIO**

- la laine de roche domestique dont on se sert pour faire pousser les plantes dans un environnement dépourvu de terre, produit des récoltes équivalentes à celles obtenues de médiums importés; on a déterminé les étapes de plantation et les niveaux optimaux de nutrition des tomates semées dans la laine de roche et on les communiqué ensuite aux producteurs. **HRIO**

- le besoin d'ingrédients moins dispendieux dans les mélanges de cultures en pot pour les pépinières a amené à recommander que le compost issu de la culture des champignons soit destiné à cette fin. **UG**

- un supplément de lumière donné aux roses de serre sur une période de deux ans, a permis d'augmenter systématiquement la récolte de cinq cultivars commerciaux de 72 à 86% à 100 umol/sec/m^2 (800 fc) d'irradiation 24 h/jour d'octobre jusqu'en mars; les catégories commerciales n'ont pas été affectées, par ailleurs on a récolté plus de roses dans chacune des catégories, ce qui a entraîné une meilleure rentabilité par serre. **UG**

Chambre de photosynthèse informatisée pour l'étude de la plante entière afin d'obtenir des conditions de croissance optimale pour les roses.

- un progrès considérable a été accompli dans la découverte de l'efficacité potentielle des agents de lutte biologique; les isolats du *Typhola phaccorrhiza*, peuvent lutter contre la moisissure grise des neiges qui s'attaque aux gazons et ainsi réduire le besoin de recourir aux fongicides. Le champignon *Fusarium heterosporum* est tout autant prometteur comme agent de lutte biologique contre la brûlure en plaques du gazon qui nuit aux agrostides stolonifères. **UG**

Conservation des cultures alimentaires

La conservation de nos cultures alimentaires est primordiale, non seulement pour assurer notre propre subsistance, mais aussi pour permettre à notre industrie de concurrencer les aliments importés. C'est pourquoi le ministère de l'Agriculture et de l'Alimentation de l'Ontario met l'accent sur la recherche alimentaire.

- pour améliorer les stratégies de récolte des pommes, on a mis au point une gamme de couleurs pour le test aux amidons et à l'iode afin de déterminer la maturité des fruits des principales variétés de l'Ontario. On a publié une fiche technique sur les essais de ce test effectués sur les pommes Empire, Idared et Spartan. **HRIO**

- un soutien tant sur le plan technique que sur celui de la recherche a permis d'introduire sur le marché une deuxième entreprise pour l'extraction de jus de raisin de l'Ontario; celle-ci offre une ligne de produits de jus de raisins "kosher". **HRIO**

- une étude faite sur l'entreposage des pommes McIntosh dans un endroit à faible concentration d'oxygène montre que le fruit demeure plus ferme s'il est d'abord entreposé à 1% d'oxygène pour une période de quatre mois et, par la suite, à 3% durant quatre mois; cette méthode n'a qu'un effet minime sur la Northern Spy alors que, avec l'entreposage réglé à 0,5 et 3,0, les pommes Empire, Spartan, Délicieuse, Délicieuse jaune et Idared demeurent plus fermes et sont moins sujettes aux désordres physiologiques tels que l'échaudure et le coeur brun. **UG**

Économie et gestion de la ferme

De bonnes habitudes d'affaires impliquent des prévisions financièrement possibles et adaptées aux conditions du marché mondial. La recherche en économie s'intéresse à la situation internationale autant qu'à la gestion des fermes individuelles et des habitudes financières.

- une étude a démontre qu'un grand nombre de techniques sont utilisées dans l'analyse des entreprises agricoles; une approche ainsi qu'une terminologie plus uniformes et cohérentes sont requises. **CCAT**

- l'examen de la conséquence des négociations présentes du GATT concernant l'agriculture canadienne porta à conclure que la libéralisation du commerce conduira à la réorganisation des politiques agricoles du Canada; le secteur laitier sera sans doute plus vulnérable, mais le marché des viandes rouges, du grain de l'est et des graines oléagineuses en sera plus fort. **UG**

Génie

La recherche en génie s'étend entre le travail en vue d'améliorer le logement du bétail et les études visant à améliorer les codes et les normes en vigueur.

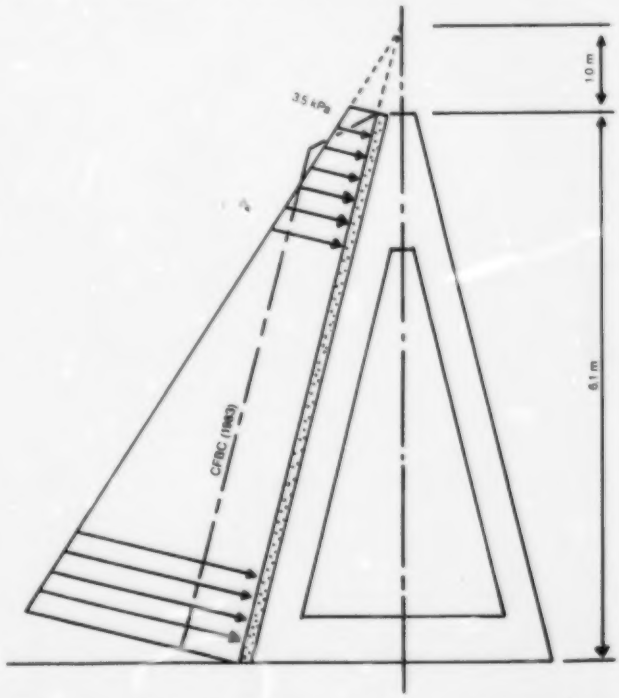
- deux ans de données ont indiqué que le taux de gain et la performance générale d'un porc en finition élevé un bâtiment ventilé naturellement sont égaux ou supérieurs à ceux d'un porc élevé dans un établissement ventilé par moyens mécaniques. **ACAFT**

- les chercheurs ont trouvé que les porcs se tenaient sensiblement plus propres dans des enclos à partitions pleines que dans ceux dont les divisions sont faites de tiges. **UG**

- des essais pratiqués sur huit ventilateurs commerciaux pour sécher le foin ont révélé des écarts importants dans la pression et le taux de ventilation, rendant difficile à l'agriculteur le choix du ventilateur adapté à ses besoins. Les chercheurs recommandent que les fabricants fournissent un graphique montrant les spécifications de leur produit. **KCAT**

- Le drainage taupe remporte un tel succès dans les sols argileux qu'on a publié un guide complet sur ce type de drainge. **ACAFT**

- les pressions latérales près de l'équipement de déchargement d'un silo se vidant par le bas sont beaucoup plus fortes que celles d'un silo à vidage par le haut, toutefois le Code canadien de construction des bâtiments agricoles (CCCBA) n'en fait aucune mention. Les chercheurs ont établi des valeurs spécifiques sur le coefficient de friction et le rapport de pression. Ces valeurs feront partie des nouvelles normes du CCCBA de 1990. Celui-ci contiendra des provisions radicalement différentes sur la construction des murs de silos horizontaux, le tout établi à partir de découvertes préliminaires obtenues d'un projet connexe. **UG**



Diagramme, obtenu analytiquement, de la pression exercée sur un mur de silo horizontal mesurant 6,1 m; la pression CCCBA (1983) est indiquée à des fins comparatives.

Lutte contre les ennemis des cultures

La lutte contre les parasites et les maladies est essentielle à la survie de l'industrie agricole. On déploie un effort particulier à l'élaboration et à l'essai de moyens de lutte

biologique afin d'ainsi réduire les quantités de pesticides chimiques dans l'environnement. On met au point des méthodes pour dépister les infestations de parasites dans les récoltes afin d'ensuite lutter contre eux par l'application d'un pesticide approprié.

Fèves atteintes de la moisissure blanche : pulvérisées à gauche, non pulvérisées à droite.

- pour venir à bout du millepertuis perforé, les chercheurs ont placé des centaines de scarabées Chrysolina sur l'île Manitoulin comme moyen de lutte biologique; ils ont déjà réduit le besoin d'herbicides. **UG**
- le *Holcotborax testaceipes*, un parasite de la mineuse marbrée, s'est établi à Guelph et peut s'avérer un substitut viable des produits chimiques utilisés dans le verger. **UG**
- un pré-traitement des plantes à l'aide de composés de triazole augmente leur résistance à la chaleur, au froid et à la sécheresse, aux polluants de l'air, à l'ozone et au bioxyde de soufre; la décomposition de la membrane oxydante est retenue, possiblement due à l'augmentation observée de la teneur des cellules en antioxydants tocophérol et ascorbate. **UG**

Gestion du sol et des eaux

La gestion du sol et des eaux est au coeur de la production agricole. On s'inquiète de plus en plus de l'érosion et de la pollution, c'est pourquoi on accorde une attention particulière à la recherche sur la prévention et à la réduction des méthodes culturales destructives.

- des études ont démontré que les régions ontariennes qui se drainent dans les rivières tributaires des Grands Lacs sont en partie responsables de la détérioration de la qualité de l'eau de ceux-ci. Il est clair que les propriétaires fonciers doivent entreprendre une gestion complète du sol et des eaux. De plus, il existe un besoin de systèmes intégrés et améliorés ainsi que des normes mieux définies pour le contrôle de la qualité des eaux quant à l'usage des pesticides agricoles. **UG**
- la découverte que la teneur en eau du sol affecte directement la photosynthèse des cultures a des implications importantes sur le modelage et les prévisions des rendements des récoltes. **UG**

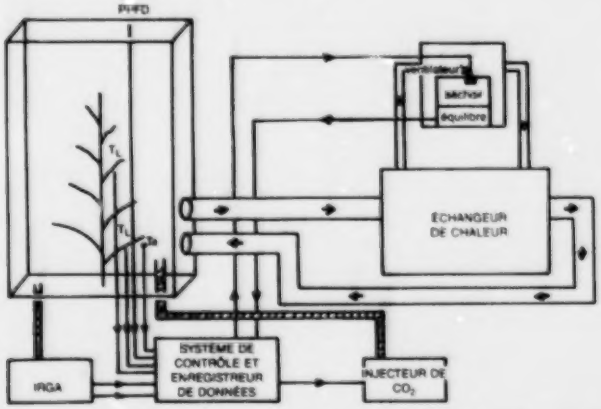


Diagramme schématique d'un système clos pour l'évaluation de l'effet de l'humidité du sol sur la photosynthèse de la plante (reproduction fondée sur le dessin de Grabam et al. 1888b). Les lignes simples avec flèches représentent les fils électriques transmettant le signal de contrôle du ou des signaux de détection au système de contrôle informatisé. Les lignes parallèles contenant des flèches sont des conduits d'air reliés au système de transfert de chaleur, et celles qui sont hachurées sont des tuyaux d'injection et d'échantillonage. Des détecteurs fournissent un contrôle ininterrompu de la température de la feuille (T_L), température de l'air (Ta), et le flux quantique (PPFD), tandis qu'un analyseur de gaz à rayons infrarouges (IRGA) contrôle les concentrations de CO_2 et de H_2O.

- le rendement des récoltes dans un sol peu ou non labouré est semblable à celui obtenu d'un sol labouré conventionnellement; les besoins en azote sont semblables pour tous les genres de labour. **UG**
- l'analyse de modèles variés de prévisions pour des programmes de conservation du sol révèle que le rendement obtenu de ces différents modèles pouvait être étonnamment variable sous certaines conditions, au point même d'en être inquiétant. Des lignes directrices pour un usage adéquat de ces modèles sont nécessaires. **UG**

L'agroforesterie est une approche relativement nouvelle pour, entre autre, réduire le problème d'érosion du sol, diminuer la pollution causée par le ruissellement et améliorer les terres endommagées.

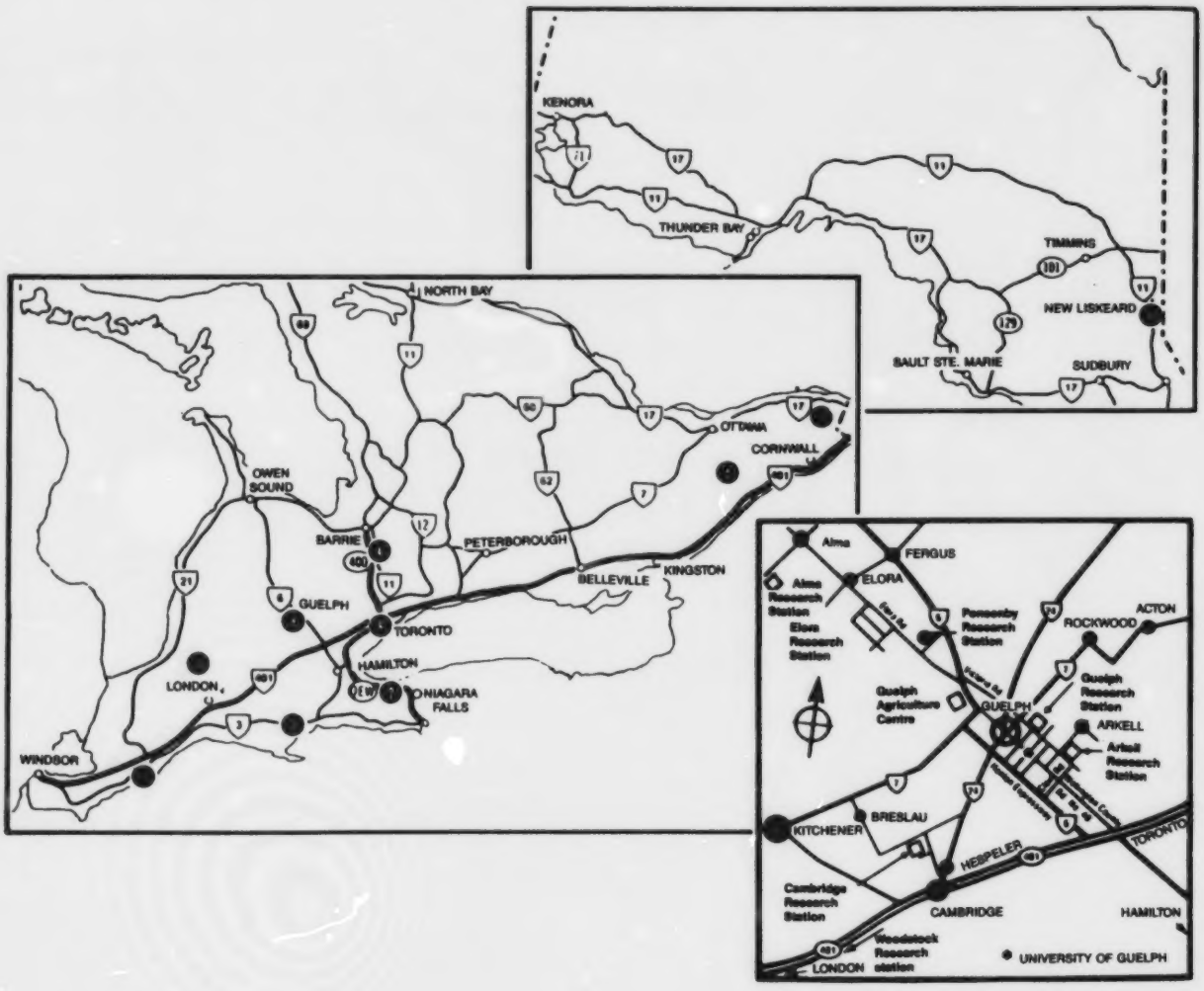
- des études ont démontré que le taux de survie des boutures de peuplier hybride plantées le long du ruisseau Washington était de 10 à 76% et de 28 à 80% pour les marcottes; les clones de l'aulne ont très bien survécu, ne démontrant que peu de différence dans la croissance du diamètre des clones testés. **UG**

Il me fait plaisir de présenter ces grandes lignes sur les résultats obtenus de nos recherches provenant de programmes subventionnés par la MAAO et révisés par l'Institut de recherche agricole de l'Ontario.

J. C. Rennie
Le Directeur de la recherche,
IRAO

Inventory of Agricultural Research Projects

The inventory of agricultural research projects contains all projects that were active during the fiscal year 1988-89. All those listed were funded completely or in part by the Ontario Ministry of Agriculture and Food. Those at the University of Guelph are carried out under an agreement with the Ministry.



1. Centralia College of Agricultural Technology
2. Horticultural Research Institute of Ontario, Vineland Station
3. Horticultural Experiment Station, Simcoe
4. Muck Research Station, Bradford
5. Kemptville College of Agricultural Technology
6. New Liskeard College of Agricultural Technology
7. Ridgetown College of Agricultural Technology
8. University of Guelph, and Agricultural Laboratory Services (OMAF)
9. Economics and Policy Coordination Branch (OMAF, Toronto)
10. Alfred College of Agriculture and Food Technology

AGRICULTURAL LABORATORY SERVICES

The Provincial Pesticide Residue Testing Laboratory is one of three sections of Agricultural Laboratory Services. The research objectives are to improve and amend pesticide registrations and recommendations in order to reduce residues below the negligible level of 0.1 mg/kg wherever possible. The physical dispersal, chemical breakdown, and microbiological degradation of pesticides and toxic metabolites are monitored to set pre-harvest intervals for application of the chemicals. This research adds to our general understanding of the fate of pesticides in the environment and in food.

Studies on the hazards of re-entry into treated areas help minimize the risks in using pesticides. This research includes monitoring the exposure, absorption, and excretion of pesticides of those who use them and studying the effect of laundering clothing to help minimize the risk of applying these chemicals. Studies on culinary practices and cooking are being conducted to determine what residues can be removed or reduced by these means.

PROJECT TITLE	RESEARCHER
LIVESTOCK	
Translocation of topically applied synthetic pyrethroid insecticide on bovine	Surgeoner, Braun
ENGINEERING	
Analytical method and development for new fungicides and herbicides	Ripley, Clegg
Modelling pesticide dissipation	Ripley, Braun, Ritcey, Frank
Immunoassay evaluation	Clegg, Hall
FIELD CROPS	
Monitoring flue-cured tobacco and soils on 34 farms for pesticide residues and metal contents	Frank, Braun, Ripley, Clegg, Suda, Zilkey
FOOD AND FOOD QUALITY	
Monitoring animal tissues for pesticide residues and metals	Frank, Braun, Luyken
Monitoring Ontario-grown fruit and vegetables for pesticide residues	Frank, Braun, Ripley, Wheeler
Disappearance of pesticides from grapes made into wine	Clegg, Ripley, Braun, Frank Geisbrecht
Method development for drugs including sulfathiazole and other sulfa drugs	Chapman, Braun, Ripley, Clegg
Researching raw and processed vegetables	Frank, Braun, Ripley

PROJECT TITLE	RESEARCHER
HORTICULTURAL CROPS	
Dissipation of pyrethroids from muck crops	Braun, McEwen, Frank
Dissipation of insecticide residues from minor crops	Frank, Braun, McEwen
Dissipation of herbicide residues from onions and organic soils	Clegg, Frank
Dissipation of fungicide residues from minor crops	Ripley, Ritcey
Studies on pesticides for minor crop registration	Frank, Ripley Braun, Clegg
Fungicides for protection of carrots against storage rots	Ripley, MacDonald
HUMAN EXPOSURE	
Following the changes in organochlorine residues in Ontario residents	Braun, Rasper
Reducing residues through culinary practices	Frank, Ritcey, Braun, Ripley
Re-entry into treated crops	Braun, Ripley, Ritcey, Frank, Clegg
SOIL WATER, AND WASTE MANAGEMENT	
Metolachlor dissipation in the field	Clegg, Frank, Patni
Monitoring shallow and deep wells for pesticides	Frank, Braun, Ripley, Clegg
Monitoring surface water for pesticides	Frank, Braun, Clegg, Ripley
Stability of pesticides in water	Clegg, Ripley, Frank, Chapman

ALFRED COLLEGE OF AGRICULTURE AND FOOD TECHNOLOGY/ COLLEGE DE TECHNOLOGIE AGRICOLE ET ALIMENTAIRE D'ALFRED

Alfred College is located 65 km east of Ottawa on the Trans-Canada Highway, #17. It is in the heart of the highest concentration of francophones in the Province and French is the language of administration and teaching at the College. It is also in one of the main milk-producing regions of Ontario where soils for the most part are of very productive clays; by their very nature, however, they are poorly drained.

Research began at the ACAFT in 1983 with a project to resolve drainage problems in this clay soil. In the fall of 1985, another was begun to evaluate the use of mole drains in combination with 'French' drains. This research has been quite successful and further work is underway.

Another project involves the improvement of designs for natural ventilation systems and to compare natural and mechanical ventilation of swine barns. In livestock feeds, interesting work has been undertaken to evaluate the use of near infrared equipment for analysing nutrients.

The College has crop demonstration plots, begun in 1984, and a maple bush in which demonstrations are given. Last year, the purchase of an additional 60 hectares brought the land base to 150 hectares.

PROJECT TITLE	RESEARCHER
ENGINEERING	
Mole drainage of flat lands	Weil, Natho-Jina
Yield and winter hardiness of alfalfa on specialized drainage systems for fine-textured soils	Weil, Natho-Jina
Natural ventilation for livestock housing	Choinière, Monroe

CENTRALIA COLLEGE OF AGRICULTURAL TECHNOLOGY

Centralia College is in the heart of Western Ontario's diverse agricultural region. In agronomy, researchers test new practices in production, such as different row widths and planting dates and the use of crop rotations and plow-down legumes, for white and coloured beans, soybeans for human and animal consumption, canola, and rutabagas. New varieties are tested for traits such as their yield potential, and pesticide screening trials are held. These data are used in selecting varieties and pesticides for registration and are the basis for Ministry production recommendations. Development continues at the new Agronomy Research Farm at Cedar Springs and the Agronomy laboratory has recently been completed.

Engineers at Centralia are studying the structural load characteristics of bottom-unloading tower silos and the efficacy of a number of different coatings for the inside of silo walls to prevent structural deterioration. Other projects now underway include an extensive study of water quality in the Parkhill Creek Watershed and development of a method for scheduling the irrigation of potatoes.

PROJECT TITLE	RESEARCHER
BUSINESS	
A study of farm business analysis calculations, interpretation and terminology	Stephens
ENGINEERING	
Evaluation of concrete silo coatings	Bellman
Extent and causes of water quality problems in subsurface drainage in the parkhill creek watershed	Brunke
Development of expert system re swine manure management	Fleming
Development of an irrigation scheduling method for the potato crop in Ontario	Jung, Brown
Ventilation system alternative for small room ventilation	Kains, Turnbull
Determination of the effect of different ventilation rates, recirculation systems and management parameters on dust and gas levels in swine buildings	Kains, Morrison, Hacker, Olgivie
Assessment of management factors in determining excretory behaviour of growing-finishing pigs	Kains, Morrison, Hacker, Olgivie
Energy use efficiency and light testing	MacDonald
Silo selection expert system	Toombs
FIELD CROPS	
Rutabaga production and management	Brolley

PROJECT TITLE	RESEARCHER
Pest control in rutabagas	Brolley
Disease control in white beans	Forrest
White bean and kidney bean management	Forrest
Oil and protein crop variety and management trials	Forrest
Soybean management	Forrest
Evaluation of plowdown species in spring grain and corn	Forrest

PROJECT TITLE	RESEARCHER
Lupin variety trial	Forrest
Lupin production management	Forrest
Insect control in white beans	O'Toole
Weed control in canola	O'Toole
Corn variety trials	O'Toole
Weed control in corn	O'Toole
Weed control in field beans	O'Toole

ECONOMICS AND POLICY COORDINATION BRANCH

The Branch is divided into three units, Policy Development, Policy Coordination, and Economic Information, and plays a central role in the overall functioning of the Ministry. Its main responsibilities lie in the development, coordination, and analysis of policy initiatives that affect the agriculture and food industry.

At the request of the Minister and senior Ministry officials, advisors and researchers in the Branch assess the economic implications of different policy choices. A number of projects are continuous including monthly newsletters on the latest data and developments in agricultural trade, in processing, distributing, and retailing (PDR), and in the farm supply business.

Economists in the Branch monitor foreign agricultural policies and developments in Ontario, other parts of Canada, and around the world and analyze them for their effects on the provincial industry. Analyses have also been carried out on matters such as the development of food quality and safety standards, various GATT Panel rulings, the beef industry task force, income stabilization, and the grape and wine industry.

The Policy Coordination unit guides the flow of legislation, regulations, and orders-in-council between the Ministry and central agencies with which the Ministry is in constant contact. It also schedules meetings and conferences for senior officials.

The Economic Information Services unit monitors the efficiency of agricultural production through a number of avenues: surveys of farms and farm supply companies, computer models on costs of production, and collation of local with international data to yield commodity price and profitability forecasts for major commodities. The unit publishes Provincial agricultural statistics each year, and makes current domestic and international prices and commodity analysis for the main products available through the Farm Market News Service. This Service telephones information into radio stations for broadcasting and directly to anyone who wishes it.

PROJECT TITLE	RESEARCHER
Direct farm sales outlets in Ontario, 1988	Tmej
Custom farmwork rates, 1989	Wind
Survey of pesticide use, 1988	McGee
Grain and forage crops, estimated production costs, Ontario, 1988	Campbell
Apple, peach and grape, estimated establishment costs, Ontario, 1988	McKibbon
Greenhouse vegetable production in Essex County, production, costs and practices, 1986 and 1987	Fisher

PROJECT TITLE	RESEARCHER
Fruit crops, estimated production costs, Ontario, 1988	McKibbon
Vegetable crops, estimated production costs, Ontario, 1988	Fisher
Cash rental rates in Ontario, 1988	Fisher
Ontario tomato production update, 1988	Fisher
Rural land values, 1988	Bohl

HORTICULTURAL RESEARCH INSTITUTE OF ONTARIO

HRIO is situated in the midst of Ontario's, and indeed Canada's prime horticultural region. It is made up of four units: the Horticultural Experiment Station and Horticultural Products Laboratory at headquarters in Vineland station, the Horticultural Experiment Station at Simcoe close to Lake Erie, and the Muck Research Station at Bradford in the Holland Marsh north of Toronto. Each unit has a specialized function, but the overall objective of the programs is to develop crops and varieties which will help make Ontario more self-sufficient in these types of food, storage and

processing technologies which will extend the market life of domestically grown produce, and mechanized crop management and energy conservation for efficient production.

AT HES, Vineland, attention is focused on protected food crops, tender and small fruits, tree fruits, edible fungi, ornamentals and cut flowers, and plant nutrition for a variety of species. Including a grape sub-station, the land base is 90 hectares.

Researchers at the HPL, Vineland, investigate storage, handling, processing, and quality of harvested fruits and vegetables. The evaluation of cultivars from HRIO's breeding program and of those from other regions is a very important part of their work. The Laboratory is increasingly concerned as well with the development of further-processed, added-value products.

The grape and wine programme at HPL is a long-standing one which includes specialists in bio-chemistry, engineering, food science, oenology, post-harvest physiology, sensory science, and microbiology. The recent development of sparkling and still grape juice products is helping make use of grapes of cultivars no longer used in winemaking.

HES, Simcoe, concentrates its efforts one-third on fruit and two-thirds on vegetables, a reflection of the commercial production in that area. Fruit research includes extensive work on apples as well as on small fruits such as strawberries, highbush blueberries, raspberries, currants, and the recently introduced tayberry from Scotland. Vegetable research emphasizes the mechanical harvesting of processing crops, particularly tomatoes and cucumbers, field tomato breeding, and the epidemiology and control of diseases.

In the past few years as well, an extensive program to develop horticultural crops as alternatives to tobacco has been set up at Simcoe under the name of The Transition Crop Team.

At the three-hectare Muck Research Station, research is focused on crops grown in the organic soils of the ancient lake bottom: chiefly onions, carrots, lettuce, and celery. Cooperative studies are carried out with HPL on storage of these vegetables, and with the University of Guelph and Agriculture Canada on controls for various pests and diseases.

PROJECT TITLE	RESEARCHER
HORTICULTURAL CROPS	
Fruit	
Fertilizer and soil management studies with grapes	Cline, Fisher
Trickle irrigation studies for horticultural crops	Cline
Soil management and fertilizer studies with peach	Cline
Soil management for highbush blueberry production	Cline
Evaluation and development of analytical methods for determining the nutrient status of plant material	Cline
Fertilizer and soil management studies with apple	Cline
Studies of the use of paper mill sludge	Cline
Replant studies with apple	Cline
Nitrogen and magnesium studies on plum	Cline, Tehrani
Grapevine population studies in relation to yield and quality	Fisher
Training systems for grape cultivars	Fisher
Breeding for wine grapes adapted to Ontario conditions	Fisher
Cold hardiness surveys with grapevines	Fisher
Vinifera cultivar and training combination trial	Fisher
Growth regulators in the vineyard	Fisher
Grape rootstock for vinifera cultivars	Fisher
Apricot breeding and cultivar evaluation	Fisher
Grape breeding for dessert cultivars adapted to Ontario climatic conditions	Fisher
Grape rootstocks — scion/rootstock combinations for non-vinifera cultivars	Fisher
Soil management irrigation and summer pruning interaction on riesling/3309 grapevines	Fisher, Cline
Summer pruning of vigorous grape cultivars	Fisher
Trickle irrigation studies for horticultural crops	Miles
Peach and nectarine cultivar evaluation	Miles
Evaluation of prunus rootstock for peach	Miles
Protected fruit culture — peaches	Miles, Cline
Peach cultivar evaluation for canker resistance	Miles
Breeding field resistance of peaches to canker disease	Miles
Breeding clingstone peaches	Miles, Wang
Protected fruit culture — kiwifruit	Miles
Protected fruit culture — apples	Miles, Elfving
Trellised peach orchard studies	Miles, Cline
Propagation methods for peach trees	Miles, Chong
Trickle irrigation studies for horticultural crops	Tehrani
Breeding sour cherry cultivars superior to montmorency	Tehrani
Breeding for early maturing European and Japanese plums and pollen compatibility studies with plums	Tehrani

PROJECT TITLE	RESEARCHER
Breeding for a seasonal succession of firm-fleshed non-cracking self-fruitful black sweet cherry cultivars and determination of incompatibility group of selections	Tehrani
Management studies with bartlett pear on quince rootstock	Tehrani
Growth and productivity of Japanese plum cultivars on different rootstock	Tehrani
Influence of different selections of prunus mahaleb rootstock on productivity and growth of two tart cherry cultivars	Tehrani
Response of European plums to replant ridging on a jeddo clay loam soil	Tehrani
Performance of anjou, bartlett and bosc pear on standard and old home x farmingdale clonal rootstock	Tehrani
Spacing trial with bartlett pear on standard rootstock	Tehrani
Regional European cultivar and rootstock planting	Tehrani
Influence of rootstock on productivity and growth of European plum cultivars and early blue Vineland selections	Tehrani
Regional pear rootstock and cultivar trials	Tehrani
Influence of rootstock on performance of advanced self-fruitful selections and standard sweet cherry cultivars	Tehrani
Influence of colt mahaleb and mazzard rootstocks on the performance of montmorency and meteor tart cherries	Tehrani
Influence of colt MXM14 P. mahaleb and P. mazzard rootstocks on productivity and growth of sweet and tart cherry cultivars	Tehrani
Evaluation of eight size-controlling quince rootstocks with compatible bartletts	Tehrani
NC-140 cooperative sweet and tart cherry rootstock trials	Tehrani
Rootstock and training study with anjou bartlett and flemish beauty pear cultivars on three quince rootstocks	Tehrani
Protected fruit culture — apples	Miles, Elfving
Effects of plant growth regulators on apple	Elfving
Effects of nitrogen fertilization on dwarf apple trees	Elfving
Irrigation of size controlled apple trees	Elfving
Orchard factors influencing apple fruit quality	Elfving
Apple rootstock evaluation	Elfving
Apple cultivar evaluation	Elfving

PROJECT TITLE	RESEARCHER
Development of improved strawberry cultivars for fresh market and processing	Dale
Evaluation of wild *Fragaria virginiana* clones for useful characteristics for cultivar breeding	Dale
Management of small fruit crops	Dale
Coordinated small fruit trials in Ontario	Dale
Vegetables and Edible Fungi	
Greenhouse tomato crop management	Straver
Greenhouse sweet pepper management	Straver
Seedless greenhouse cucumber production	Straver
Substrates for greenhouse vegetable production	Straver
Mushroom crop management — casing soil studies	Rinker
Production of alternate fungi	Rinker
Mushroom crop management — response to supplementation	Rinker
Mushroom pest management — evaluation of pesticides	Rinker
Mushroom compost — substrate preparation and formulation	Rinker
Potato management and physiology	McKeown
Tomato management and physiology	McKeown
Seed potato management and physiology	McKeown
Production practices for vine crops	O'Sullivan
Influence of cultivars and other factors of production on yield and quality of peppers	O'Sullivan
New crop development	Schumacher
Cole crop production and management	Schumacher
Asparagus production and management	Schumacher
Garlic production and physiology	Schumacher
Field tomato breeding	Brammall
Greenhouse tomato breeding	Brammall
Ornamentals	
Development of alstroemeria as a greenhouse crop	Blom
Commercial parameters for production of anemones in greenhouses	Blom
Influence of soil cooling on greenhouse freesia production	Blom

PROJECT TITLE	RESEARCHER
Factors influencing greenhouse gerbera production	Blom
Factors influencing greenhouse poinsettia production	Blom
Nitrogen fertilization of greenhouse roses	Blom
Greenhouse roses on rockwool	Blom
Evaluation of rooting media for poinsettia cuttings	Blom
Evaluation of easter lily production techniques	Blom
Comparison of double acrylic and single glass for greenhouse glazing	Blom
Evaluation of polyethylene films for greenhouse glazing	Blom
Evaluation of irrigation systems for containerized production	Blom
Evaluation of primula vulgaris and P. x polyanthus cultivars timing of primula vulgaris through photoperiodic control	Blom
Chemical protectants for roadside salt spray	Chong
Soil amendments for containerized nursery crops	Chong, Cline, Rinker
Fieldgrown fabric container culture	Chong
Rooting media for propagation of ornamental cuttings	Chong
Influence of growth substances on rooting of woody ornamentals	Chong
Caliper ornamental nursery tree production using fieldgrown containers and trickle irrigation	Chong
Influence of pH on rooting of ornamental cuttings	Chong, Blom
Micropropagation of new strawberry selections	Chong, Dale
Micropropagation of ornamentals	Chong
Effect of aerial and rooting environment on rooting of woody ornamental nursery crops	Chong
A rapid technique for obtaining cytospora resistant peach plants	Chong, Miles
Propagation methods for peach trees	Chong

PEST MANAGEMENT AND DISEASE CONTROL

The development of herbicide programs for various horticultural crops	O'Sullivan
Vegetable pathology	Brammall

PROJECT TITLE	RESEARCHER

FOOD AND FOOD QUALITY

Development of an ethylene measurement technique to determine apple harvest maturity	Chu
Development of a starch-iodine test guide for maturity evaluation of Ontario apples	Chu
Rootstock effects on harvest maturity of apples	Chu
Controlled atmosphere storage of apples	Chu
Low oxygen storage of apples	Chu
Low ethylene storage of apples	Chu
Studies on Paclobutrazol effects on apple maturity and storage life	Chu
Studies on controlled atmosphere storage of green bell peppers	Chu
Studies on cauliflower controlled atmosphere storage	Chu
Evaluation of new grape varieties for wine production	Edinger
Development of improved wine quality control methods	Edinger
Modification of white wine production	Edinger
Use of enzymes in wine production and analyses	Edinger
Occurrence and control of microbial metabolites in wine	Edinger
Recovery of useful constituents from grape pomace and other fruit and vegetable processing plant waste material	Fuleki
Juice potential of commercial grape cultivars	Fuleki
Analysis of chemical and physical indexes of quality of juice, wine, and table grape cultivars and selections	Fuleki
Ultrafiltration and reverse osmosis in beverage technology	Fuleki
Colour quality problems in horticultural crops and their products	Fuleki
Anthocyanin pigment composition of horticultural crops grown in Ontario	Fuleki
Chemical fingerprinting of fruits	Fuleki
Development of HPLC — based analytical methods for quality control in the food and beverage industry	Fuleki
Development of methods for measuring external and internal colour of fruits, vegetables and their products	Fuleki

PROJECT TITLE	RESEARCHER
Storage facility operation and management	Lauro
Development of storage monitoring technology	Lauro
Energy aspects of storage	Lauro
Technical and economic evaluation of fruit and vegetable storage systems	Lauro
Automated environment monitoring	Lauro
Engineering aspects of food processing	Lauro
Storage studies on stone fruit	Smith
Storage studies on peaches for processing	Smith
Strawberries — Modified atmosphere packaging	Smith
Storage studies on strawberries for processing	Smith
Celery storage — Development of technology for MA storage of Ontario-grown celery	Smith
Improvement of cranberry growing in Ontario	Smith
Crucifer crop storage studies	Smith
Onion storage studies	Smith

PROJECT TITLE	RESEARCHER
Processing quality studies on tomatoes	Wang
Quality monitoring techniques for processing tomatoes	Wang
Processing studies on stored peaches	Wang
Processing quality studies on peaches	Wang
Processing quality studies on small fruit	Wang
Processing studies on strawberries	Wang
Processing quality studies on apricots	Wang
Processing quality studies on bell peppers	Wang
Utilization of surplus and waste fruit and vegetable materials	Wang
Application of improved freezing methods on fruit and vegetables	Wang
Processing of honey products	Wang
Analysis of grape quality in Ontario	Chudyk
Microbiology of storages	Chudyk

KEMPTVILLE COLLEGE OF AGRICULTURAL TECHNOLOGY

Eastern Ontario has been an area which specialized in livestock and forage crops. In recent years, however, farmers have expanded their repertoire to include crops such as soybeans and blueberries. This diversification has been stimulated to a great extent by research at Kemptville which has selected cultivars tailormade for the region and has developed production methods to fit.

In field crops, KCAT's agronomists help provide the research committees with variety and management data from trials on corn, soybeans, cereals, and forages and with regional recommendations on soil management and weed control.

In horticulture, research has helped develop the industry in the area. Local strawberry production has become quite a successful business and the growing of lowbush blueberry bushes for commercial purposes has the potential to be also.

The Food Science section of the College supports other research through quality assessment.

Animal Science research supports the $270 million milk industry of Eastern Ontario and the livestock sales that are a spinoff from that industry. A dairy herd is maintained, not only for education, but for nutritional and management research. For the past decade, calf research has been a major thrust of the program. The red veal, heavy calf market established across Ontario has been enhanced and encouraged by this research.

PROJECT TITLE	RESEARCHER
LIVESTOCK	
Beef	
Comparative study on application of ionophores in the heavy calf diet	Drevjany
Application of antistress supplement for new arrivals to the heavy calf barn	Drevjany
Increasing the protein and energy density of a high moisture ear corn diet with protein and fat	Drevjany
The feedlot performance of cull holstein dairy cows fed with and without ionophores	McKnight

PROJECT TITLE	RESEARCHER
LIVESTOCK	
Dairy	
Influence of megalac on milk production by high producing cows in early lactation — effects of megalac on grain palatability and production costs	Wheeler
Investigation of installation cost and durability of four manger surfaces in a tie stall dairy barn	Wheeler
Influence of dietary zinc methionine supplementation on somatic cell counts and mastitis incidence	Wheeler

PROJECT TITLE	RESEARCHER
FOOD AND FOOD QUALITY	
Evaluating the chemical, textural and sensory properties of red veal, white veal and beef	Johnson, Reasbeck, Drevjany
Binding and texture in restructured beef steaks	Johnson
Thermal precipitation of proteins from milk whey blends	Hunter
A study to examine the nutrient intake and food group intake of patients with stable chronic obstructive pulmonary disease	Sanderson, Reasbeck
FIELD CROPS	
Forage production and management	Madill
Field corn production and management	Curnoe
Oil seed production and management	MacDonald
Cereal production and management	Hoekstra
HORTICULTURAL CROPS	
Fruit production and management	Morton
Vegetable production and management	Langenberg
Maple syrup production	Langenberg
ENGINEERING	
Mole drainage and crops management	Cuthbertson
Watershed runoff study	Stone, Johnson, Hilborn, Stinson
On farm evaluation of the performance and reliability of new fan and heater control	Plue, Holmes
Evaluation and adaptation of drainage cost/benefit software	Toombs, Cuthbertson
Field evaluation of natural air corn drying in eastern Ontario	Plue, Cuthbertson, Holmes
Hay drying fan evaluation	Gillespie, Holmes, Doody
Big bale hay drying	Plue, Holmes

NEW LISKEARD COLLEGE OF AGRICULTURAL TECHNOLOGY

New Liskeard, the Ministry's most northerly college, has developed a comprehensive research program to assist farmers in this particular area. This year, crop testing sites are under development in the districts of Rainy River and Thunder Bay to give farmers in the Northwest of the Province recommendations suitable to their conditions. An Agronomy Research Laboratory is under construction as well on the New Liskeard campus, facilities which will enhance the research program there.

Research is carried out here in beef cattle, field and horticultural crops, and farm management. The cow-calf herd was expanded recently to allow for a more wide-ranging program on nutrition, breeding efficiency, and feeding animals on pasture. This reflects the importance of this industry in Northern Ontario. Along with agronomic research, chiefly in barley, oats, and forages, horticultural studies in berries, sweet corn, and cole crops are helping farmers diversify.

PROJECT TITLE	RESEARCHER
LIVESTOCK	
Beef	
Pasture development in Northern Ontario	Sharpe, Gumprich
Sheep	
Pasture test for rams	Sharpe
Kale and rape as late autumn pasture for ewes	Sharpe
Dairy	
Stray voltage effects on dairy cattle	Gumprich
ENGINEERING	
Low temperature grain drying	Hawkins
FIELD CROPS	
Grain	
Intensive barley production	Skepasts
Barley variety testing program	Skepasts
Oats variety testing program	Skepasts
Wheat variety testing program	Skepasts
Misc. grains variety testing program	Skepasts
Effect of date of seeding and rate of nitrogen in oats production	Skepasts

PROJECT TITLE	RESEARCHER
Forage	
Forage grass cultivar evaluation	Skepasts
Forage grasses cultivar evaluation program	Skepasts
Forage legume cultivar evaluation program	Skepasts
Silage corn hybrid evaluation program	Skepasts
Gene pool corn test	Skepasts
Pastures	
Simulated pasture management test	Skepasts
Oil and Protein Seed Crops	
Canola variety testing program	Skepasts
Flax variety testing program	Skepasts
Soybean variety testing program	Skepasts
Field peas variety testing program	Skepasts

PROJECT TITLE	RESEARCHER
HORTICULTURAL CROPS	
The effects of plastic mulch on direct-seeded and transplanted cucumbers	Hughes
Biennial cropping of raspberries	Hughes
Raspberry cultivar evaluation	Hughes
Strawberry cultivar evaluation	Hughes
Flat row vs. raised bed for strawberry production in Northern Ontario	Hughes
Chinese cabbage — preliminary trial	Hughes
SOIL, WATER AND WASTE MANAGEMENT	
Nitrogen fertilization of canola in Northeastern Ontario	Rowsell
Response of barley and alfalfa to limestone in Northern Ontario	Rowsell

RIDGETOWN COLLEGE OF AGRICULTURAL TECHNOLOGY

About one-third of our agricultural production comes from Southwestern Ontario. It has the highest heat unit range in Canada, a favourable climate, and a broad selection of fertile soils. Research to assist this bountiful harvest has been going on at Ridgetown for 65 years, since its founding in 1922 as the Western Ontario Experimental Farm.

The swine program is the main focus of livestock research, but work is also carried out with beef and dairy cattle. The purebred Holstein herd is consistently the highest producing herd in Kent County.

Since 60% of the region's farmland is in field crops, chiefly soybeans, corn, and winter wheat, extensive testing and monitoring is done on varieties and corn hybrids in these crops. In horticultural crops as well, emphasis is placed on cultivar testing and management systems for efficient production. Pest management studies complement these studies.

Agricultural engineering research reflects this 'crop' mix with work on both livestock housing and tillage machinery and storage facilities. Soil researchers carry out work as well on tillage methods along with studies on windbreaks and shelterbelts, interseeding to halt soil degradation, and fertilizer application trials.

In the farm management area, Ridgetown's economists develop and refine financial and record-keeping methods easily adapted to individual farms, and analyze production systems and marketing strategies. The use of the computer in farming is an important part of this program.

PROJECT TITLE	RESEARCHER
LIVESTOCK	
Beef	
The effect of frame size and post-partum energy intake on reproductive performance in beef cows	Osborne, DeSchutter
Evaluation of protein supplements for alfalfa and corn silage for steer and heifer calves	Osborne
Computer software development, livestock enterprise models for profit and sundry software development analysis	Morris, Osborne, DeSchutter
The effect of preconditioning on the performance of beef calves	DeSchutter

PROJECT TITLE	RESEARCHER
Dairy	
Application of chronobiological techniques to parturition in dairy and beef cattle	Osborne
Swine	
Two-tiered penning for growing pigs	Morris, Underwood
Roasted soybeans vs extruded vs solvent-extracted soybean meal for weaner pigs	Morris
Causes of pre-weaning piglet mortality	DeSchutter
Optimal dilution rates of mouldy corn to market hogs	DeSchutter

PROJECT TITLE	RESEARCHER
Effective protein levels in roasted soybean diets	Morris
Free choice penning for dry sows	Morris, Underwood
Lysine supplementation for growing and/or finishing pigs	DeSchutter
Effectiveness and profitability of creep feed programs for young pigs	DeSchutter
The efficacy of PGH on growth performance and carcass merit of market pigs	Morris
The efficacy of Palasweet in the drinking water of weaner pigs	Morris

ECONOMICS

Impact of the corn countervail duty on Ontario corn price determination process	Doidge
Option usage for livestock vs. alternative marketing methods	Dennison
Examination of the behaviour of cash prices for finished feeder cattle and hogs by location and season	Dennison
Analysis of Ontario cash corn and soybean prices cycles	Doidge
Agricultural options usage versus alternative marketing methods	Doidge
Analysis of Ontario elevator buying/selling price spreads	Doidge

ENGINEERING

Ventilation control in swine barns	Underwood
Spray cooling in naturally ventilated barns	Underwood
Low temperature grain drying	Underwood
To determine the spray pattern of 80° and 110° spray nozzles under simulated field conditions	Underwood

FIELD CROPS

Grain

Hybrid corn evaluation for grain and forage	McLaren
Tissue analysis for nutrient content as affected by various fertilizer practices	Johnston, Brimner
Tissue analysis for nutrient content as affected by various fertilizer practices (nitrogen and phosphorus)	Brimner
Micronutrients in field crops — yield and nutrient composition practices — zinc, manganese, copper, boron	Johnston
Evaluation of potential of broomcorn in Southwestern Ontario	McLaren
Cereal management	Smid
Production studies in grain corn	McLaren
Evaluation of cereal cultivars	Smid

Forage

Forage varieties and management	McLaren

Oil and Protein Seed Crops

Cultural studies in soybeans	Ablett
Evaluation of field bean types and cultivars	Ablett
Cultural studies in field beans	Ablett
Development and evaluation of soybean cultivars	Ablett
Chickpea production in Southwestern Ontario	Ablett
Alterations of fatty acids in soybeans	Ablett
Winter canola production	Ablett

HORTICULTURAL CROPS

Fruit

Performance and hardiness testing of tender fruit, grapes and apple varieties in Kent County	Muehmer

Vegetables

Cultivar testing and management studies of various vegetable crops in greenhouses	Muehmer
Breeding, cultivar testing, and management studies with processing peppers	Muehmer
Cultivar testing and management studies with cole crops and other small acreage crops	Muehmer
Cultural and management studies in processing tomatoes under Southwestern Ontario conditions	Muehmer
Cultivar testing and evaluation of processing and greenhouse tomatoes	Muehmer
Production research in processing vegetables	Schaafsma
Cultural and management studies of vegetable transplants in high density trays under Southwestern Ontario greenhouse conditions	Muehmer
Tomato, pepper plug-plant research	Pitblado

PROJECT TITLE	RESEARCHER
PEST MANAGEMENT AND DISEASE CONTROL	
Effect of herbicides on weed control and field corn	Brown
Effect of herbicides on weed control and crop response in vegetable and fruit crops, transplanted and field seeded tomatoes, peppers, asparagus, and fruit trees	Brown
Studies in the control of specific weeds	Brown
Soil insect control in field corn	Schaafsma
Insect and disease control in field tomatoes	Pitblado
Herbicides in the control of specific weeds	Shaw
Disease control in horticultural crops	Pitblado
Insect control in horticultural crops	Pitblado
Disease control in field crops	Schaafsma
Foliar insect control in field crops	Schaafsma
Weed control in vegetable crops	Shaw
Weed control in beans	Shaw
Weed control in cereals and forages	Shaw
Weed management systems in reduced-till field crops	Shaw
Rearing European corn borer for corn inbred evaluation	Pitblado
Evaluation of the resistance of malathion in populations of Indian meal moth in Southwestern Ontario	Schaafsma
SOILS, WATER AND WASTE MANAGEMENT	
Energy conservation in tillage and residue management for crop production in Southwestern Ontario	Young
Nitrogen research with winter wheat	Stevenson
Nitrogen research with corn using conservation tillage	Stevenson
Shelterbelt protection and crop growth and yield	Baldwin
Interseeding in corn	Baldwin, Nanni
Phosphorous and potassium soil test calibration research with soybeans	Stevenson
Phosphorous and potassium soil test calibration research with corn	Stevenson
Crop production with no-traffic tillage system	Baldwin
Nitrogen on hard red spring wheat	Baldwin
Effect of hybrid plant population and plant nutrients on growth and yield of corn	Stevenson
Composted sewage sludge on corn and soybeans	Baldwin
Crop rotation effects on crop yields and soil properties in Southwestern Ontario	Young

UNIVERSITY OF GUELPH

For over a century, the Ontario Agricultural College, the Ontario Veterinary College, and since the 1960's, other Colleges at the University have run research programs on behalf of the Ministry. The nature of these programs has changed a great deal over the years, and the scope has broadened dramatically. New disciplines such as environmental biology, plant and animal biotechnology, and energy management have been introduced to complement traditional ones such as animal husbandry and horticulture.

In the early years, research and demonstrations were held on what is now the University campus. Now, much of this work has been moved to the seven experimental farms owned by the Ministry and run, under contract, by the University: Alma (aquaculture), Arkell (swine, poultry, engineering, environmental biology), Cambridge (horticultural crops, turf management, pest management), Elora (beef, dairy, field crops, soils), Guelph (feed production), Ponsonby (animal health), and Woodstock (field crops). The main areas emphasized in each of Guelph's agricultural research programs are listed below followed by the titles of current projects within each program.

PROJECT TITLE	RESEARCHER
LIVESTOCK	
Beef	
Characteristics of donors and recipients influencing the efficiency of beef production through embryo transfer	Wilton
Determination of genetic differences in feed conversion rates for beef cows and feedlot cattle	Wilton
Separation and utilization of whole plant corn silage	Mowat
Feeding frequency on the utilization of forages	Mowat
Alfalfa silage for growing weaned calves	Mowat, Buchanan-Smith
Regulation of protein metabolism to control body composition in cattle.	McBride, Ball

PROJECT TITLE	RESEARCHER
Warm carcass grading and quality evaluation of beef carcasses	Gullett, Usborne
Bovine collagen metabolism	Ball
Inter-relationships between nutrition and the manifestation of lung disease in ruminants	Bray
Characterization of the fibrolytic enzymes from bacteroides succinogenes	Forsberg
Development potential of bovine oocytes matured and fertilized in vitro	Walton, Basrur
Determining alternative fibre sources for central test station bulls using feed intake recording devices	Wilton
Increasing the protein utilization in alfalfa/ grass silages	Mowat, Buchanan-Smith
Environmental influences on ovarian activity in postpartum beef cows — preliminary study	Walton
Dairy	
Development of an automated system of measuring milking speed in dairy cows	Schaeffer, Burnside
Evaluation of Holstein-Friesian A.I. sires for stillbirths and ease of calving	Schaeffer, Burnside
The effects of plant and fish protein in preruminant calf diets on growth, health and immunological parameters	Burton
Genetic and environmental causes of immuno-globulin levels in Canadian dairy cattle	Wilkie, Burton Burnside
Effect of ration protein degradability on lactation response	Buchanan-Smith, Grieve
Comparison of dairy cows of high genetic merit for production with varying size	Burnside, Burton McBride
Efficacy of recombinant growth hormone (rbGH) for lactating cows	MacLeod, Burton
Consequences of fibre upon digestive function and productivity of lactating cows fed silage based diets	MacLeod, Grovum, Buchanan-Smith, Zelin
The sensitivity and specificity of cowside milk progesterone tests	Walton, Etherington, Leslie
Feeding strategies to enhance rumen function and productivity of dairy cows	Grieve
Growth rates, composition and performance of dairy replacement heifers	Buchanan-Smith, Grieve, McBride
Methods for genetic improvement of dairy cattle	Kennedy
Sire and cow evaluation methods	Kennedy, Schaeffer
Effect of nutrition on reproduction of dairy bulls entered into A I units	King, Buchanan-Smith, Grieve

PROJECT TITLE	RESEARCHER
Genetic manipulation of bacteroides succinogenes to enhance fibre digestion in the rumen	Gibbins
Construction of diagnostic probes for virulent ureaplasma spp. in cattle	Gibbins
Antibodies as hormones: the use of anti-idiotypic antibodies to enhance animal performance	Walton
Swine	
Ingestive behaviour of neonatal piglets	Morrison, Hurnik
Determination of factors affecting effective environmental temperature for the young pig	Morrison
Effect of dietary amino acids on polyamine metabolism in swine	Smith
Treatment of T-2 toxicoses by supplemental dietary amino acids	Smith
Proline metabolism in young pigs	Ball
Assessment of management factors determining excretory behaviour of growing-finishing pigs	Hacker, Morrison
Protein and available amino acid requirement of pigs	Young
Histological observations of the small intestine and performance of starter pigs fed different protein sources	Young
Genetic improvement of swine on a population basis	Kennedy
Effect of boar odors on ovarian function in gilts and sows	Walton, Ball
Influence of electronic feeding on sow reproduction	Hacker
Fat Utilization in Swine	Young
Effect of amino acid supplementation on stress, meat quality and body composition in swine	Ball
Exploitation of exogenous and endogenous growth regulators for pork production	Bayley
High levels of food intake, growth rate and efficiency of carcass deposition	Bayley
Regulation of androsterone biosynthesis and control of boar taint	Squires
Causes of stillbirths and improving piglet viability	Hacker
Evaluation of porcine somatotropin (PST) for improved performance and carcass quality in finishing pigs	Hacker, Bowman, Ball
Factors affecting the fertility of boar semen	Buhr

PROJECT TITLE	RESEARCHER
Poultry	
Efficacy of growth promoters, antibiotics and anticoccidials for poultry	Leeson
Behaviour of hens in battery cages	Hurnik
Development of feeding systems for poultry	Leeson
Environmental factors affecting efficiency of production in poultry	Morrison
The control of egg-yolk protein synthesis in domestic birds	Gibbins
Salt reduction in processed poultry products	Barbut
Development of methods of gene transfer in domestic birds	Etches
Isolation, identification and characterization of reproductive hormones in domestic birds	Etches
Lighting regimes for turkey toms	Etches
Factors regulating the development of a single functional ovary in poultry	Squires
Investigation of the molecular basis for fatty liver hemorrhagic syndrome	Squires
Poultry egg production curves	McMillan
Effect of microwave cooking method on quality of whole stuffed turkeys	Gullett, Collins-Thompson
Isolation, culture and intraspecific transfer of chicken primordial germ cells	Etches
Biomedical Sciences	
3-Methylindole-induced pulmonary edema and metabolic basis of prolonged pulmonary disease in ruminants	Atwal
The hemostatic mechanism in cattle: significance of the Factor XI protein	Gentry
Metabolic and morphologic basis of pulmonary alveolar-capillary permeability and detoxification of metabolites	Atwal
Steroid biosynthesis in the testes of the boar	Raeside
Brown adipose tissue: A physiological and biochemical study	Harris, Yamashiro
Pathogenesis of mycotoxicosis in domestic animals	Gentry
Reproductive problems in twin bulls produced by embryo transfer	Basrur
Direct action of glucotcorticosteroids on the ovary in the pig	Raeside
Analysis of the intersex syndrome(s) in swine	Partlow, Fisher

PROJECT TITLE	RESEARCHER
Pharmacological study of the equine hoof in relation to the etiology and therapy of laminitis	Black
Endocrinology of gestation in the mare	Raeside, Savage
Study of lavage and biopsies for diagnosis of respiratory diseases	Yamashiro, Viel, Croy, Willoughby
Assessment of immunocompetent cells within the pregnant uterus	Croy
Combined toxicity of mercury, lead and cadmium in domestic ducks	Bhatnagar
Correlative uterine and ovarian histology and plasma steroid levels in sows with experimentally induced cystic ovaries	Geissinger
Oxytocin challenge test in the cow	Liptrap
Actinides and estrogens as environmental contaminants in poultry	Robinson
Acquired disorders of hemostasis in the horse: the role of natural inhibitors	Johnstone
Small intestine function in the calf	Chapman
An evaluation of dosage level and treatment interval of levamisole in the prevention of shipping fever pneumonia	Black, Conlon
T-cell receptor genes in domestic animals	Croy, Yager, Kruth
Detection of antiobiotic residues in milk following intrauterine infusions	Black
Direct effects of glucotcorticosteroids on porcine ovarian function	Liptrap
Vascular stress in swine	Downie
The role of sensory receptors and endocrine factors in controlling rumen function and food intake in ruminants	Grovum
Plasma fibronectin in domestic animals	Gentry
Development of biotechnological methods of embryo manipulation for advancement of the embryo transfer industry	Betteridge, Johnson, Croy, King, Wildeman
Hair growth disorder in ranch foxes	Goldberg, Hardy, Falding
The use of a GnRH antagonist to delay ovulation in superovulated holstein heifers and its effect on numbers, development & morphological quality of embryos	Rieger, Johnson, Walton
Investigation into effects of toxins on disease resistance of animals	Boermans
Pharmacokinetics and toxicity of second generation anticoagulants in the equine	Boermans, Johnstone, Black
Relaxin and the timing of birth/ Relaxin and blood pressure in pregnancy	Summerlee

PROJECT TITLE	RESEARCHER
Effect of pasteurella haemolytica exotoxin on bovine alveolar macrophage function	Conlon
The pathogenesis of pasteurella haemolytica cytotoxin on bovine airway smooth muscle	Harris, Yamashiro
A study of the effects of levamisole on cellular responses to a respiratory virus in cattle	Conlon, Black
The possible involvement of relaxin in porcine hypogalactia	Porter
Study of biology of pregnancy establishment in horses	Betteridge
Dermal-epidermal and other interactions in differentiation and disorders of mammalian skin	Hardy, Falding
The embryonic genome and its expression during early development	King
Relaxin: physiology and pathophysiology (gene probe investigation of ruminant relaxin)	Porter
Pathology	
Surveillance of parasite diseases of domesticated animals in Ontario	Slocombe
Host parasite interaction in the coccidia – pathogenetic	Fernando
Experimental oncology	Valli
Pathogencity of the H. somnus complex in the bovine	Little
SDA; An important coronavirus infection in the rat	Percy
Surveillance of diseases in laboratory animals	Percy
Studies on lameness and leg problems in broiler chickens and turkeys	Julian
Pathogenesis of bovine ocular squamous cell carcinoma	Stirtzinger, Valli, Livesey
Strongyles in equines: biology, pathogeneses, epidemiology and control	Slocombe, McCraw
Biochemical analysis of the serum of leghorn layer flocks: Comparison of normal flocks and those with poor egg or shell quality	Lumsden, Julian
Effects of ureaplasma diversum on bovine embryos: In vitro studies	Miller
Investigation into reproductive failure and normal mortality on mink ranches	Hunter
Natural bone disease in sheep as a model for osteogenesis imperfecta in man	Hulland
Right ventricular failure and ascites in broiler and roaster chickens	Julian
Immunopathogenesis of infection with bovine leukemia virus	Valli

PROJECT TITLE	RESEARCHER
Ureaplasma diversum as a cause of infertility in cattle	Miller
Pathogenesis and prevention of rhodococcus equi pneumonia	Yager
Investigation into respiratory disease in turkeys	Hunter
Restriction endonuclease analysis of bovine leukemia virus genetic variants	Jacobs
Enteritis complex in the commercial rabbit: A field study	Percy
Histopathological study of normal and dead avian embryos and membranes	Julian
Actinobacillus pleuropneumoniae: the evaluation of a major toxin in pathogenesis and its use in treatment and control	Little, Brash
The relationship of various health factors to milk composition and culling in dairy cattle	Valli, Leslie
Definitive diagnosis of susceptibility to porcine stress syndrome: development of a cost effective protocol for clinical application	O'Brien, Lumsden
Effects of PCB (Aroclor 1254) on the cerical apocrine gland of neonatal mink	Hunter, Hunter
Muscle steatosis in pigs	Hulland
Population Medicine	
Improved diagnostic and prophylactic procedures for the control of pleuropneumonia in Ontario swine	Johnson, Rosendal
Embryo transfer and artificial insemination	Buckrell, Walton
Relationship of prostaglandin administration histological and bacteriological results of endometrial biopsy & rectal palpation	Etherington, Johnson, Martin, Liptrap, Savage, Miller
Porcine embryo culture	Johnson, King
Project to identify and improve the health and productivity of Ontario beef cow-calf herd	Martin, Meek, Bateman
Laparoscopic embryo transfer in sheep	Buckrell, Johnson
Isolation, identification and synthesis of estrous phermone in the mare	McKeown, Luescher, Teal
Leg weakness affecting breeding-age swine: an observational study	Friendship, Wilson
Assessment of a commercially available enzyme immuno-assay to determine post-partum milk progesterone values in dairy cows	Etherington, Johnson, Leslie, Walton
Effect of cryopreservation on bisected sheep embryos/sheep artificial insemination and embryo transfer	Buckrell, Johnson
Study of the effect of a microcomputer based management system on dairy herd performance	Menzies, Etherington, Leslie, Martin, Meek

PROJECT TITLE	RESEARCHER
Tail tip necrosis in beef cattle	Luescher, McKeown, Wilcock, Meek
Control of caseous lymphadenitis in a commercial dairy goat herd	Menzies, Muckle
A study of the occurrence, characteristics and significance of L-form variants of staphylococcus aureus in bovine mastitis	Muckle, Menzies, Leslie
Prostaglandin treatment of subestrus, cystic ovarian degeneration and cyclicity following superovulation in dairy cattle	Leslie, Etherington
An epidemiological study of paratuberculosis in Ontario dairy cattle	Meek, Martin
Evaluation of long acting and conventional oxytetracycline for therapy of feedlot respiratory disease	Bateman, Martin
The relationship between bulk milk culture results, management factors used in mastitis control, and herd prevalence of mastitis	Leslie, Meek, Martin, Muckle
An epidemiological study of antibiotic residues in bulk milk from Ontario dairy farms	McEwen, Black, Meek
Evaluation of cowside Eliza milk progesterone assays as a means of improvement of estrous detection and reproductive performance	Etherington, Walton, Leslie, Johnson
Effects of human chorionic gonadotrophin administered 5 days after breeding on third service conception rates	Leslie, Walton
The effect of environmental influences in intensive confinement systems	Friendship, Wilson, Luescher
Prevention of downgrading losses in turkeys	McEwen, Barbut, Julian
A proposal to investigate the economic and biologic efficacy of preconditioning beef calves	Martin
Fertility in beef bulls	Johnson, Etherington, Buckrell, Bonnett, Liptrap, Wilton
The use of rapid milk progesterone tests for improved therapy of common reproductive problems and in embryo transfer programs	Leslie, Bateman, Etherington
An evaluation of the predictive value of an ELISA system for zearalonone and mycotoxins in feedstuff	Wilson
Evaluation of a pasteurella haemolytica vaccine/ bacterial extract (Presponse) for the prevention of UBRD in recently shipped feedlot calves	Bateman
Shepherds – Sheep Health & Productivity Herd Study – a project to identify and improve disease & management in Ontario sheep flocks	Menzies, Buckrell, Lumsden, Waltner-Toews, Physick-Sheard, Walton
Cryopreservation of embryos by vitrification	Johnson

PROJECT TITLE	RESEARCHER
An epidemiological investigation of undifferentiated bovine respiratory disease in large feedlot-pen conditions	Meek, Martin
DNA probes and monoclonal antibodies for detection of verotoxigenic E. coli from cattle	Gyles, McEwen, Lam, Waltner-Toews
Beefwatch: A spreadsheet to monitor cow-calf herd productivity	Martin, Bateman
A comparison of the effectiveness of two routes of prostaglandin F2 for the induction of parturition in swine	Friendship
A study of the association of growth in height, weight & pelvic size with reproductive performance calving ease and productivity in Holstein heifers	Leslie, Bateman, Bonnett
The determination of the cause of early embryonic death and the identification of factors associated with early embryonic death and litter size	Martin, Friendship, Kennedy, Wilson
Immunization of primary SPF pigs against Glasser's disease (infectious porcine polyserositis)	Miniats
Evaluation of cross protection among strains of haemophilus parasuis in immunized gnotobiotic pigs	Miniats
An investigation of seasonal infertility of swine	Friendship, Raeside, Hacker, Martin
An observational study and survey to evaluate the prevalence and effects of fusarial mycotoxins on swine in Ontario	Wilson
The development and treatment of stereotypies in horses	Luescher, McKeown
Pathogenesis and immunology of bovine parvovirus infection	Sandals

Veterinary Microbiology & Immunology

Host resistance to pasteurella haemolytica	Shewen, Wilkie
Genetic control of immune response and disease resistance in pigs	Wilkie
Pathogenesis of the disease in goats caused by mycoplasma mycoides subsp. mycoides	Rosendal
Relationship between milk immunoglobulin concentrations in early lactation and the incidence of mastitis in current and future	Johnson, Muckle, Barnum, Leslie
Molecular analysis of haemophilus (actinobacillus pleuropneumoniae and related organisms)	MacInnes, Rosendal
Post-weaning E. coli diarrhea: detection of antigens for use in vaccines	Gyles
Purification of protective antigens of rhodococcus equi	Prescott
Relationship of plasmids to virulence in avian salmonellae	Gyles

PROJECT TITLE	RESEARCHER
Rapid detection of viruses from infected animals using ELISA and monoclonal antibodies	Thorsen
Role of serum resistance proteins in E. coli mastitis	Muckle
The biology of porcine interferons	Derbyshire
Leptospiral abortion in swine	Prescott
Host immune response to chlamydia psittaci	Shewen
Development of fowlpox virus as a vector for live recombinant poultry virus vaccines	Derbyshire, Krell
Evaluation of a rapid automated bacterial identification/antimicrobial susceptibility testing system	Muckle
Gut-associated reovirus infections of chickens	Thorsen
The evaluation of "milk checker" as a cow-side test in the detection of bovine mastitis	Barnum
The prevalence and significance of viral infections of sheep in Ontario	Thorsen
Verocytotoxins of porcine E. coli	Gyles
Survey and control of coxiellosis in dairy goats and dairy cattle	Lang
Immune responses to oral vaccination of piglets with transmissible gastroenteritis virus	Derbyshire
Virulence and molecular epidemiology of infectious laryngotracheitis virus, a herpes virus of chickens	Nagy
Molecular analysis of actinobacillus pleuropneumoniae virulence factors	MacInnes, Rosendal
Development and application of an improved serodiagnostic test for caprine arthritis encephalitis (CAE)	Thorsen
Development of a DNA probe for diagnosis of porcine parvovirus infection	Johnson, Krell
Diagnosis of parvovirus, transmissible gastro-enteritis virus and rotavirus infections in swine	Johnson, Derbyshire
Bovine viral diarrhea/mucosal disease: A study of prevalence and biological activity of the causal virus in infected herds	Thorsen, Baird
Clinical Studies	
Evaluation of systemic effects of topically applied atropine in the horse	Pascoe
Evaluation of a new approach to acid base balance	Viel, Pascoe, Staempfli
Abnormal bone growth in copper-deficient foals	Hurtig
Refining rabbit model to study mycobacterium paratuberculosis enteritis	Butler
Peritoneal fluid analysis in periparturient mares	Shappell, Savage

PROJECT TITLE	RESEARCHER
Immunocytochemical identification of equine influenza virus and equine influenza virus and equine herpes virus type I in experimentally infected horses	Viel, Willoughby, Lang
Microbial flora of the upper and lower airways of feedlot calves with undifferentiated bovine respiratory disease	Viel, Bateman
Field evaluation of a commercial M-protein vaccine (Strep Vax II) in a feedlot for foals with epidemics of strangles	Staempfli, Waltner-Toews, Viel, Prescott
Isolation of mycobacterium paratuberculosis in SCID mice	Butler
Characterization and comparison of in vivo and in vitro airway responsiveness in recurrent airway obstruction	Viel, McDonell
Role of clostridium cadaveris in severe colitis in horses	Staempfli, Prescott
Fish	
Gill disease of fish	Ferguson
Significance of neoplasia in wild fish populations	Hayes, Ferguson
Evaluation of tiger trout hybrids for aquaculture	McMillan
Disease in British Columbian fish hatcheries and cage sites, with particular reference to pacific salmon	Ferguson
Evaluation of the effects of administration of hormones on growth rate, blood and tissue comp of rainbow trout	Leatherland
Development of a growth hormone assay for rainbow trout	Leatherland, Etches
Proteogenic effect of dietary leucine in skeletal muscle of rainbow trout	Smith
Fish waste production – rainbow trout culture	Chisholm
Fish species susceptibility to Yersinia ruckeri	Stevenson
Gene probe for infectious pancreatic necrosis virus of fish	Stevenson, Dobos
Gene probe for bacterial kidney disease of fish	Stevenson
Gene probe for enteric redmouth disease of fish	Stevenson
Use of triploidy induction in the improvement of rainbow trout production traits	McMillan
Rainbow trout spawning study	McMillan
The vitamin B12 requirement of young rainbow trout	Woodward
Brain neurotransmitters and food intake regulation in rainbow trout	Glanville

PROJECT TITLE	RESEARCHER
Tryptophan requirement of rainbow trout: assessment by growth direct and indirect amino acid oxidation techniques	Bayley
Preparation of monoclonal antibodies to salmonid pituitary hormones for development of hormone assays	Leatherland
Equine Centre	
Genetic improvement of the canadian hunter for height, conformation and development	Burnside
Articular cartilage transplantation in the horse	Hurtig
Temporary bilateral occlusion of the common carotid artery	Livesey, Dyson, Atwal
The role of nuclear medicine in the diagnosis of equine lameness	Livesey, Pennock, Willoughby
The effects of three therapeutic regimes on small intestine viability following hemorrhagic strangulation in the pony	Pascoe, Grovum, Barker
The role of the fetus in the hormonal regulation of gestation	Raeside
A study of acute outbreaks of respiratory diseases in horses in Ontario	Willoughby, Viel, Gyles, Thorsen, Staempfli
Evaluation of Synergistin (R) treatment in foals with experimentally induced bacterial bronchopneumonia	Viel, Staempfli, Muckle, McDonell
Bees	
Pollination and seed quality and harvest in oil seed crops	Kevan
Requirements for pollination in small fruits	Kevan
Biology and control of parasitic mites of honey bees	Otis, Scott-Dupree
Honey bee biology and management	Otis, Scott-Dupree
ECONOMICS	
Forecasting beef and hog prices	Martin
A price forecasting mechanism for the Canadian beef-pork sector	Martin
Farm structure and performance in Canada	Brinkman
Marketing strategies for Ontario grain producers	Martin
Marketing strategies for Ontario livestock operations	Martin
"Evaluation of feedgrain marketing facilities for Temiskaming"	Goddard
The economics of shopping and bargaining in the purchase of production inputs	Funk
The effectiveness of advertising milk in Ontario	Goddard
The quantitative assessment of domestic and international trade policies	Meilke
Economics of technological change in the livestock sector	Fox
ENGINEERING	
Analysis of corn grain yield in relation to tillage and climatic conditions	Farazdaghi
Measurement of floor and wall pressures in a bottom-unloading farm silo	Jofriet, Negi
Toxic gas formation in silo fermentations	Meiering
Soil tool geometrics and physical properties of soils	Lee
Design of farm building components	Negi
Peanut drying and quality control using microwaves	Otten
Hemicellulose utilization by yeasts: bioconversion of D-xylose to ethanol	Lee
Bunker silo wall loads	Jofriet
Development of an on-farm alfalfa separating (fractionating) unit	Bilanski
Heat-processing alfalfa while drying to increase its nitrogen availability to livestock	Bilanski
Densities, pressures and capacities of barley silage in farm tower silos	Jofriet, Negi
Air velocities in livestock buildings	Ogilvie
FIELD CROPS	
Grain	
Development and evaluation of corn breeding techniques	Kannenberg
Evaluation of corn hybrids	Kannenberg
Development and improvement of corn breeding populations and inbreds	Kannenberg
Effects of crop sequence on oil structure, stability and productivity	Vyn
Effects of hybrid selection and management on grain corn quality	Vyn
Effects of tillage systems and wheel traffic on soil structure and corn response	Vyn
Production studies on barley and oats	Gamble
Cytogenetic studies in cereals	Kasha, Falk, Hunt, Reinbergs

PROJECT TITLE	RESEARCHER
Crop improvement through plant cell and tissue culture	Kasha
Testing new improved varieties of cereals	Hunt, Falk
Haploid production and utilization in cereals	Hunt, Falk, Kasha, Reinbergs
Breeding new and improved varieties of winter and spring wheats	Hunt
Breeding improved cultivars of spring barley	Falk
Breeding improved cultivars of winter barley	Falk
Breeding improved cultivars of oats	Falk
Breeding improved varieties of winter triticale	Hunt
Improvements of oat anther culture technique	Falk
Winterhardiness in cereals	McKersie

Forages

Seed production studies in forage and turf species	Gamble
Selection for forage yield in grasses	Christie
Forage cultivar evaluation	Christie, Bowley
Winterhardiness of Alfalfa	Bowley, McKersie
A legume ideotype for grain crop sod-seeding	Clark
Development of hybrid alfalfa	McKersie, Bowley
Productivity of beef cattle on pasture	Clark, Buchanan-Smith
Legumes for plowdown	Christie
Alfalfa – selection for winterhardiness	Christie
Alfalfa seed production	Christie
Improvement of forage quality in alfalfa	Christie
Diseases of alfalfa	Boland, Christie
Gametophytic self-incompatibility	Bowley
Forage legume — vesicular asbuscular mycorrhizal associations	Bowley, Peterson
Population development of forage legumes	Bowley
Application of tissue culture and molecular biology to alfalfa improvement	Pauls
Development and utilization of biotechnology for oilseed crop improvement	Pauls

Oil & Protein Seed Crops

Common bean breeding and genetics	Michaels
Seed vigour of soybean and fieldbean	Gamble
Soybean breeding and evaluation	Tanner
New management systems for common bean production	Michaels
Peanut breeding and genetics	Michaels, Tanner
Effect of genotype and environment on quality aspects of soybeans and rapeseed	Tanner, Hume Beversdorf
Spring rapeseed breeding and evaluation	Beversdorf, Hume
Winter rapeseed breeding and evaluation	Beversdorf, Hume
Agrobacterium mediated transformation of haploid b. napus	Ellis, Pauls
Improving soybean nitrogen fixation and production efficiency	Hume
Spring oilseed testing and management	Hume
Winter canola testing and management	Hume

FOOD & FOOD QUALITY

Metabolic activities of psychrotrophic bacteria & incidence of opportunistic microorganisms in relation to quality of dairy & food products: method	Cunningham
Controlled atmosphere (CA) storage of apples	Lougheed, Murr, Wolyn
Controlled atmosphere storage of vegetables	Lougheed, Murr
Microbial utilization of liquid agricultural and industrial carbohydrate wastes from food & fermentation industries	Cunningham
An investigation of the major factors influencing the stability and quality of restructured meat products	Stanley
Moisture mobility, product quality and functionality of meat emulsions due to binders, extenders and meats	Usborne, Mittal
Characterization and nutritional assessment of oilseeds and processed vegetable oils from newly developed varieties of Ont. canola	Holub
Factors regulating the processability of Ontario-grown potatoes	Stanley, Lougheed, Yada
Bio-fuel fermentation control	Meiering
Investigation of the hard-to-cook defect in Ontario white beans	Stanley, Michaels
Effect of freezing conditions on quality of ground meat	Usborne, Mittal
The use of MDPM in further processed products	Barbut
Chill-injury in Ontario tomatoes	Stanley, Yada, Murr, Thompson
Sensory evaluation and consumer acceptance of restructured beef steak	Gullett, Roth
Evening primrose oil as a lipid source in 'humanized' infant formula	Glanville

PROJECT TITLE	RESEARCHER
A new cheese for export markets	Hill
Manufacture of cheddar cheese from ultrafiltered milk	Hill, Ferrier
Thermal precipitation of proteins from milk whey blends	Hill
Potential toxicity from overheating vegetable oils	Alexander
Relationships between meat yield and meat quality	Swatland
Ontario soybeans for direct human food use	DeMan
Oxidative rancidity and flavour deterioration in meat products	Barbut, Draper
Improving the organoleptic quality of irradiated food	Ferrier, Yada

HORTICULTURAL CROPS

Vegetables

The nutritional requirements of cauliflower with special reference to the incidence of black speck and brown-hollow stems	Riekels
Breeding of rutabagas and asparagus	Nonnecke, Souza, Machado, Harney
Breeding and evaluating potato varieties for Ontario	Coffin
Asparagus variety improvement and cultural practices	Wolyn
Incorporation of turnip mosaic virus resistance into rutabaga/rutabaga breeding	Shattuck
Responses of vegetable crops to industrial pollutant stress	Ormrod
Evaluation of the nitrogen and boron nutrition of broccoli by analysis of transport fluid composition	Shelp
Physiological and biochemical mutants of nitrogen assimilation in the nodulated legume	Shelp, Michaels Shattuck

Fruit

Effect of pre-harvest and post-harvest factors upon the physiology and regulation of fruit ripening	Murr, Lougheed
Production techniques for tree fruits, particularly apple	Proctor, Lougheed
Effect of management scheme on yield and fruit quality of red raspberry	Sullivan
Raspberry breeding	Sullivan
Strawberry breeding	Sullivan
Strawberry management	Sullivan

PROJECT TITLE	RESEARCHER

Ornamentals

Production and handling practices influencing keeping quality of cut roses	Tsujita, Murr, Grodzinski
Physical, chemical & environmental parameters in container growing	Lumis
The influence of cultural practice on landscape trees	Lumis

Turfgrass

Insect pests of turfgrass	Sears
Integrated management of turfgrass disease	Burpee
Herbicide and plant growth regulator research in turf	Hall, Stephenson
Competitive ability of turfgrasses	Eggens
Turfgrass cultivar evaluation	Eggens
Turf renovation	Eggens
Nutrient requirements and response of turf to fertilizers	Bates

AGROFORESTRY

Intercropping of black walnut with agricultural crops in Southern Ontario	Gordon

PEST MANAGEMENT AND DISEASE CONTROL

Diseases

Fungal parasites of nematodes	Barron
Disease management practices for improved productivity of winter wheat	Sutton
Biology and control of low-temperature-tolerant plant pathogenic fungi	Burpee
Management of white mold in white beans	Hall
Biocontrol of grey mold fruit rot of strawberries	Sutton

Insects

Control of the onion maggot	McEwen
Pesticides for minor crops	McIver
Biology of orchard insects	Laing
Biosystematics of decay-related diptera	Marshall
Bionomics of hemiptera parasitoids (phasiinae: Tachinidae)	Marshall
Anthropod & vertebrate pest control as related to livestock & poultry	Surgeoner
Insect pests of vegetable crops	Sears

PROJECT TITLE	RESEARCHER
Biology and control of insects affecting the production of forage and field crops	Ellis
Weeds	
Industrial oils and waxes from weeds	Alex, Rattray
Biological control of weeds	Alex
Physiology and biochemistry of herbicide selectivity in plants	Stephenson
Plant growth regulating properties of triadimefon	Fletcher
Environmental fate of herbicides and other pesticides	Stephenson
Weed control in conservation tillage	Swanton
Berry crop weed control	Cain
Weed control in ornamentals	Cain
Evaluation of new herbicide treatments for control of weeds in field crops	Swanton, Anderson

SOIL, WATER, & WASTE MANAGEMENT

Agrometeorology	
Acquisition and compilation of agroclimatological data	Gillespie, King
Investigation of planetary boundary layer models to estimate regional-scale climates	Thurtell, Gillespie
Measurement and estimation of crop microclimates for pest management	Gillespie
Microclimatic influences on water status of dead plant tissue	Gillespie, Thurtell
Effects of elevated atmospheric CO_2 concentration on yield and water use efficiency of crops in the field	Kidd, King
Effects of environmental and physiological factors on net photosynthesis of field crops	Kidd, King
Turbulent diffusion processes and trace gas detection	Kidd, Thurtell
Plant water relationships	Kidd, Thurtell
Scheduling irrigation for optimum water use and yield of potatoes	Brown, Dixon, Coffin
Streamwater Management	
A mathematical model for the investigation of tube drainage effects on surface and subsurface streamflow components	Stammers
Control of soil erosion and associated water pollution	Dickinson, Rudra
Riparian forest plantations for wood production, soil erosion control and stream rehabilitation	Kaushik, Gordon

PROJECT TITLE	RESEARCHER
Land Use	
Impact of farm tenancy on agricultural land use	van Vuuren
Land rating for agriculture	Smit
Development of a rating system for soil compaction susceptibility	McBride
Drainage versus preservation of wetlands	van Vuuren
Impact of taxation on adopting subsurface drainage	van Vuuren
Development of an index of soil quality	Protz
Development of a rating system to evaluate agricultural land at the local level — phase II	Hilts, McBride, Brown
Implementation of landsat and spot satellite resource data into a microcomputer based county level geographic information system	Protz
Socio-economic factors in local land rating	Rodd, Penfold
The economics of conservation tillage in Southwestern Ontario	Fox
An evaluation of the economic viability of rehabilitating severely eroded croplands	Stonehouse, McBride
Developing a local land evaluation system	Brown, Taylor
Crop & Soil Management	
Forage systems as nitrogen sources in crop production	Sheard
Interaction of soil drainage, species and plant nutrition	Sheard
Phosphorus and potassium requirements for alfalfa production	Sheard
A maximum alfalfa yield project for Ontario	Sheard
Soil test calibration for the major field crops	Sheard
Development and evaluation of methods for prediction of macro/micronutrient requirements of crops	Bates
Use of sewage sludge on agricultural land with emphasis on plant availability of heavy metals	Bates
Water and chemical transport in soils	Elrick
The frequency/magnitude of wind erosion & relationship to soil type & agri-production systems in Southern Ontario	Nickling
Regional climate/soil/water relationships for drainage	Chisholm
Charge characteristics of Ontario soils	Evans
Nitrogen fertilizer use efficiency under conservation tillage system	Kachanoski

PROJECT TITLE	RESEARCHER
The relative importance of disease and insect control on alfalfa production	Sheard, Boland, Ellis
Protein enhancement winter wheat through nitrogen use	Sheard
Evaluation of soil additives for erosion control	Groenevelt
Evaluation of a nitrogen soil test and the fate of fall-applied N.	Kachanoski, Beauchamp
Identification of soil management and cropping practices which sustain the capability of a soil to accept, cycle and store organic matter	Voroney
Crop residue management and phytotoxin effects under conservation tillage	Voroney

PROJECT TITLE	RESEARCHER
Methods of application of fertilizer at planting for corn in conservation tillage systems	Miller
Development of a riser inlet	Rudra, Dickinson
Production opportunities on non-prime lands	Smit, Bray
Identification of critical success factors for farm managers in Ontario	Fox, Harling
The economics of mastitis control practices on Ontario dairies	Leslie, Howard, Meek
Strategic management of farm businesses	Harling

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